

POPULAR SCIENCE

FOUNDED 1872

MONTHLY

December
15¢



Movies Train Big-Game Fishermen .. PAGE 13

Nearly a Quarter of a Million Men and Women Have Enrolled in

THE National Educational Alliance

HERE is an unparalleled opportunity to get the higher education you need for personal advancement. You can now broaden your mental equipment, bring your knowledge up-to-date—more interestingly and at less cost than you would ever have thought possible.

The National Educational Alliance brings you 57 practical and cultural reading courses prepared by outstanding educators from the universities and colleges of the country. These courses are of such wide scope and so diversified in character that you will find many that you will want to study—especially when you can get them for only *one cent a lesson!*

How These Courses Are Presented

There are no enrollment or student fees; membership in the Alliance is free. The courses are presented through the pages of a fascinating weekly periodical—THE POPULAR EDUCATOR. When you join, you start to receive THE POPULAR EDUCATOR each week, for which you pay only 25c per issue. The first issue you receive includes 32 "No. 1 Lectures" in 32 different courses of instruction—among which are courses in History, Chemistry, Business English, Mathematics, Photography, Languages, Psychology, and others of equal interest and value.

The second weekly issue brings you the "No. 2 Lectures" in these subjects, and so on. Additional courses are introduced as you go along, until all 57 courses have been presented complete in 53 issues. It is, of course, not necessary to study all the courses at once. You may follow only the subjects you want to learn, just as you follow in a magazine the particular serial that interests you most. At any later time, you may return to Issue No. 1 and take up the study of any additional courses you wish. To preserve your copies for reference, in orderly and attractive form, a handsome binder is available at trifling extra cost.

Each course, whether practical or cultural, is as entertaining and informative as an expert in the subject, plus a popular writer, can make it. Each lecture is short enough to read at one sitting. You can carry THE POPULAR EDUCATOR in your pocket and read it on the train or during any spare minutes of the day.

Each issue contains an average of 75 illustrations, consisting of photographs, drawings and diagrams, to make the lectures doubly interesting and clear.

YOUR FACULTY IS THIS NATIONAL



E. A. Sellers, B.S.,
M.A., Ph.D.
Louisiana State
University
ACCOUNTANCY



F. M. Kercheville,
B.A., M.A., Ph.D.
State University
of New Mexico
SPANISH



E. Karl McGinnis
Univ. of Texas
LAW

Authorities of the Highest Standing from the Leading Universities and Colleges

E. A. Sellers, B.S., M.A., Ph.D.
Louisiana State University
ACCOUNTANCY
Theodor von Karman, M.E., Ph.D.
Guggenheim Aeronaut. Laboratory
Frank Malina, Research Fellow
Calif. Inst. of Tech.
AERONAUTICS
H. E. Barnes, M.A., Ph.D.
New School for Social Research
AMERICAN HISTORY
Clark Wissler, A.B., Ph.D., LL.D.
Yale University
ANTHROPOLOGY
Ernest Pickering, B.S.C., M.Arch.
University of Cincinnati
ART AND ARCHITECTURE
Clyde Fisher, Ph.D., LL.D.
Amer. Museum of Natural History
ASTRONOMY
John Hiram Gerould, Ph.D.
Dartmouth College
BIOLOGY
John Presley Fife, Ph.D.
S Stevens Institute of Technology
BUSINESS ENGLISH
L. A. Goldblatt, Ph.D.
University of Pittsburgh
CHEMISTRY

Dorrance S. White, Ph.D.
State University of Iowa
CLASSICAL LITERATURE
Walter Prichard Eaton, B.A.
Yale University
DRAMA
Andrew M. Vincent
University of Oregon
DRAWING AND DESIGN
Thomas A. Knott, Ph.D.
University of Michigan
ENGLISH LANGUAGE
Hoyt H. Hudson, Ph.D.
Princeton University
ENGLISH LITERATURE
Earl F. Langwell, Ph.B.
University of Notre Dame
FRENCH
Samuel Tilden Brattan
University of Missouri
GEOGRAPHY
Gerald G. Walsh, S.J., B.A., M.A.,
Ph.D., S.T.D.
Fordham University
ITALIAN
Grant M. Hyde, B.A., M.A.
University of Wisconsin
JOURNALISM

Average Cost Per Course is only 25 cents!

To see how amazingly little this education costs, take for example a subject like PSYCHOLOGY. If you had to attend lectures on this subject in person at college, it would cost you hundreds of dollars—even an elementary textbook would cost you three or four. Yet the Alliance teaches you this useful science for a whole year—as part of the whole curriculum—for a COST OF EXACTLY 25c! Other popular courses such as ENGLISH (speaking, reading, writing), MATHEMATICS, etc., cost you just as little!

1,543 Lectures—2,347 Pictures—49 Color Plates

Here is such a wide choice of educational opportunities that you will find among them every course of instruction you want. Even if you do not feel the need of studying systematically a single one of the 57 courses, you will still find in THE POPULAR EDUCATOR a vast wealth of articles as fascinating as could be found in any popular non-fiction magazine.

Each weekly number will give you the biggest quarter's worth you ever had!

[See opposite page]

THE MOST IMPORTANT DEVELOPMENT IN MODERN ADULT EDUCATION—ORGANIZED TO HELP PEOPLE BROADEN THEIR KNOWLEDGE—at *Amazingly Low Cost!*

COUNCIL OF FAMOUS EDUCATORS



F. T. Stockton,
A.B., L.H.D., Ph.D.
Univ. of Kansas
ECONOMICS



L. L. Hendren,
A.B., M.A., Ph.D.
Univ. of Georgia
PHYSICS



Howard H. Preston,
Ph.D.
University of
Washington
MONEY

Roy J. Deferrari, A.B., M.A., Ph.D.
Catholic University of America
LATIN

E. Karl McGinnis
University of Texas
LAW

William Whitfield Elliott, A.B., Ph.D.
Duke University
MATHEMATICS

Tibor Kerekes, Ph.D.
Georgetown University
MODERN EUROPEAN HISTORY

Howard H. Preston, Ph.D.
University of Washington
MONEY

P. W. Dykema, M.L.
Columbia University
MUSIC

O. E. Johnson, Ph.D.
State University of Iowa
PHILOLOGY

Frank T. Stockton, A.B., L.H.D.,
Ph.D.
University of Kansas
ECONOMICS

Fred Asa Barnes, C.E., M.C.E.,
F.A.A.S.
Cornell University
ENGINEERING

H. E. Himwich, M.D.
Union University
PHYSIOLOGY AND ANATOMY

Adam R. Gilliland, B.O., B.A., Ph.D.
Northwestern University
PSYCHOLOGY

Richard D. Fay
Mass. Institute of Technology
RADIO

Harry A. Overstreet, A.B., B.Sc.
City College of New York
PHILOSOPHY

L. L. Hendren, A.B., M.A., Ph.D.
University of Georgia
PHYSICS

Allan Nevins, A.B., M.A., Ph.D.,
Litt.D., LL.D.
Columbia University
SOCIAL HISTORY

F. M. Kercheville, B.A., M.A., Ph.D.
State University of New Mexico
SPANISH

Rennie Wilbur Doane
Stanford University
ZOOLOGY

AND MANY OTHERS,
INCLUDING COURSES IN
SHORTHAND, TYPEWRITING,
INTERIOR DECORATING,
PHOTOGRAPHY, etc.

57 HIGH SCHOOL AND
COLLEGE COURSES PRESENTED
IN THE POPULAR EDUCATOR

for only **1¢** a Lesson!



**EDUCATIONAL
OPPORTUNITIES
FOR EVERYONE!**

YOU PAY ONLY

25¢

A
WEEK

ENROLL IN THE NEW CLASS NOW FORMING

**No Obligation to Continue—
Stop Whenever You Wish**

Nearly 250,000 enrolled in the Alliance's Spring Class. Thousands more have already registered in the new class. Act at once if you wish to join this group. Simply mail the coupon at the right, with 25c for your first issue of THE POPULAR EDUCATOR, and you will be enrolled in the National Educational Alliance.

NATIONAL EDUCATIONAL ALLIANCE, INC.
37 West 47th Street New York, N. Y.

Copyright, 1938, by the National Educational Alliance, Inc.

Wrap up 25c and Mail It Now
for your First Popular Educator

NATIONAL EDUCATIONAL ALLIANCE, Inc., Dept. CT.
37 West 47th Street, New York, N. Y.

For the inclosed 25c, please send me the first issue containing a group of 32 Lectures in the Alliance's courses, prepaid, and enroll me for one year. You may send me THE POPULAR EDUCATOR weekly at the rate of 25c a week, until I give you notice to cancel. For convenience in bookkeeping, you may bill me once a month for such copies as I receive.

Name.....

Address.....

City & State.....

PLEASE WRITE PLAINLY

RAYMOND J. BROWN, *Editor*

ARTHUR WAKELING, Home Workshop Editor

GEORGE H. WALTZ, Jr., Associate Editor

ALDEN P. ARMAGNAC, Associate Editor

SYDNEY OXBERRY, Art Editor

CONTENTS FOR DECEMBER 1938

<u>Goodbye Gearshift!</u>	63
<u>Cameras Show How Lightning Strikes</u>	68
<u>Grooming the Skyliners</u>	73
<u>Photos from the Grave</u>	85
<u>This Auto Is a Complete Airport</u>	94
<u>Famous Planes Fly Again</u>	100
<u>Secrets of the Wire Tappers</u>	104
<u>Preserving Our History in a Tomb</u>	110
<u>From Classroom to Job</u>	118
<u>Radio Gets Silent Noisemakers</u>	136
<u>Hobbies Are His Hobby</u>	142

Features and Departments

<u>OUR READERS SAY —</u>	12
<u>NEW IDEAS FOR HOME OWNERS</u>	50
<u>THE MAN WITH THE NET</u>	129
<u>POPULAR SCIENCE QUESTION BEE</u>	152
<u>UN-NATURAL HISTORY</u>	153
<u>NEW HOUSEHOLD APPLIANCES</u>	154
<u>GUS WILSON'S MODEL GARAGE</u>	156
<u>AMATEUR PHOTOGRAPHY</u>	172
<u>HOME-LABORATORY CHEMISTRY</u>	208
<u>ADVENTURES WITH YOUR MICROSCOPE</u>	214
<u>RADIO DEPARTMENT</u>	218
<u>USEFUL HINTS FOR MOTORISTS</u>	224

COVER DESIGN BY EDGAR F. WITTMACK

AUTOMOBILES

<u>Trucks Cut Vertical Pipe</u>	22
<u>Hand-Held Driving Visor</u>	26
<u>Battery Can't Be Overfilled</u>	70
<u>Rubber Disks Mark Traffic Lanes</u>	70
<u>Homemade Car Hits 130-Mile Speed</u>	79
<u>Cars Get Radio Traffic Lights</u>	91
<u>Blinders Help Train Drivers</u>	92
<u>Water Softener Protects Cars</u>	93
<u>Waterfall Gives Free Car Wash</u>	106
<u>Wreck in Tree Is Danger Sign</u>	109
<u>Cars Get Central Heating System</u>	128
<u>Plunger Helps Fill Grease Guns</u>	228
<u>Tube Protects Oil-Can Spout</u>	228
<u>Rubber Pads Prevent Scratches</u>	230

AVIATION

<u>New Radio-Operated Compass</u>	79
<u>Trailers for Planes Carry Fuel</u>	80
<u>"Stratosphere" Test Chamber</u>	122
<u>Wind Tunnel Creates 400-Mile Gale</u>	127
<u>Safety Plane Lands at a Standstill</u>	135

HEALTH AND HYGIENE

<u>Vacuum Cleaner Purifies Air</u>	99
<u>Vaporizer Works in Water Glass</u>	106
<u>Clinic Studies Cause of Bad Breath</u>	116
<u>Scale in Soda-Fountain Seat</u>	127
<u>Mosquitoes Help Treat Mental Cases</u> ..	146
<u>Patients Ride Monorail Car</u>	151

HOUSEHOLD AIDS

<u>New-Type Storm Window</u>	52
<u>Boards Bend to Any Shape</u>	52

(Continued on page 4)

THE HOME WORKSHOP begins on page 159

Published monthly at 353 Fourth Avenue, New York, N. Y., by Popular Science Publishing Co., Inc. A. L. Cole, President and Treasurer; Godfrey Hammond, Executive Vice President; R. C. Wilson, Vice President; John Nichols, Vice President; C. D. Freeman, Vice President; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, at the Post Office at New York under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U. S. A. Copyright, 1938, by Popular Science Publishing Co., Inc. All rights reserved in the United States, Great Britain, and in all countries participating in the International Copyright Convention and the Pan American Copyright Convention. Single copy, 15 cents. Yearly subscriptions to United States, its possessions, and Canada, \$1.50; foreign countries, excepting Canada, \$2. Subscribers must notify us of change of address four weeks in advance of the next publication date. Be sure to give both old and new address. The contents of this magazine must not be reprinted without permission. The editors are not responsible for unsolicited contributions, and cannot guarantee the return of such material or insure against its loss. Contributions not accompanied by sufficient postage will not be returned. In presenting numerous stories of new products of applied science, Popular Science Monthly does not underwrite the business methods of the individuals or concerns producing them. To avoid liability for patent infringement, readers should investigate before making, using, or offering for sale any of the devices, machines, or processes described; Popular Science Monthly takes no responsibility. The use of Popular Science Monthly articles for stock-selling schemes is never authorized.

SMARTER STYLING...FINER ENGINEERING...YET 1939 Plymouth is Lower Priced!

Imagine Getting all these
Great Engineering
Features—at Plymouth's
NEW LOWER PRICES!

Never Before Has a Low-Priced Car Offered So Much Value

- | | |
|---|----------------------------------|
| 1. Greater Size—114-in. Wheelbase. | 4. New Auto-Mesh Transmission. |
| 2. New High-Torque Engine Performance with New Economy. | 5. New Amola Steel Coil Springs. |
| 3. Perfected Remote Control Gear Shifting—much easier. | 6. "Safety Signal" Speedometer. |
| | 7. New True-Steady Steering. |
| | 8. 100% Hydraulic Brakes. |

ISN'T IT great news about the new 1939 Plymouth—the value is *up*, but the prices are *down*!

There's new shifting ease in Plymouth's Perfected Remote Control Shifting with All-Silent Auto-Mesh Transmission—standard on "De Luxe"...a great new ride with new Amola Steel Coil Springs!

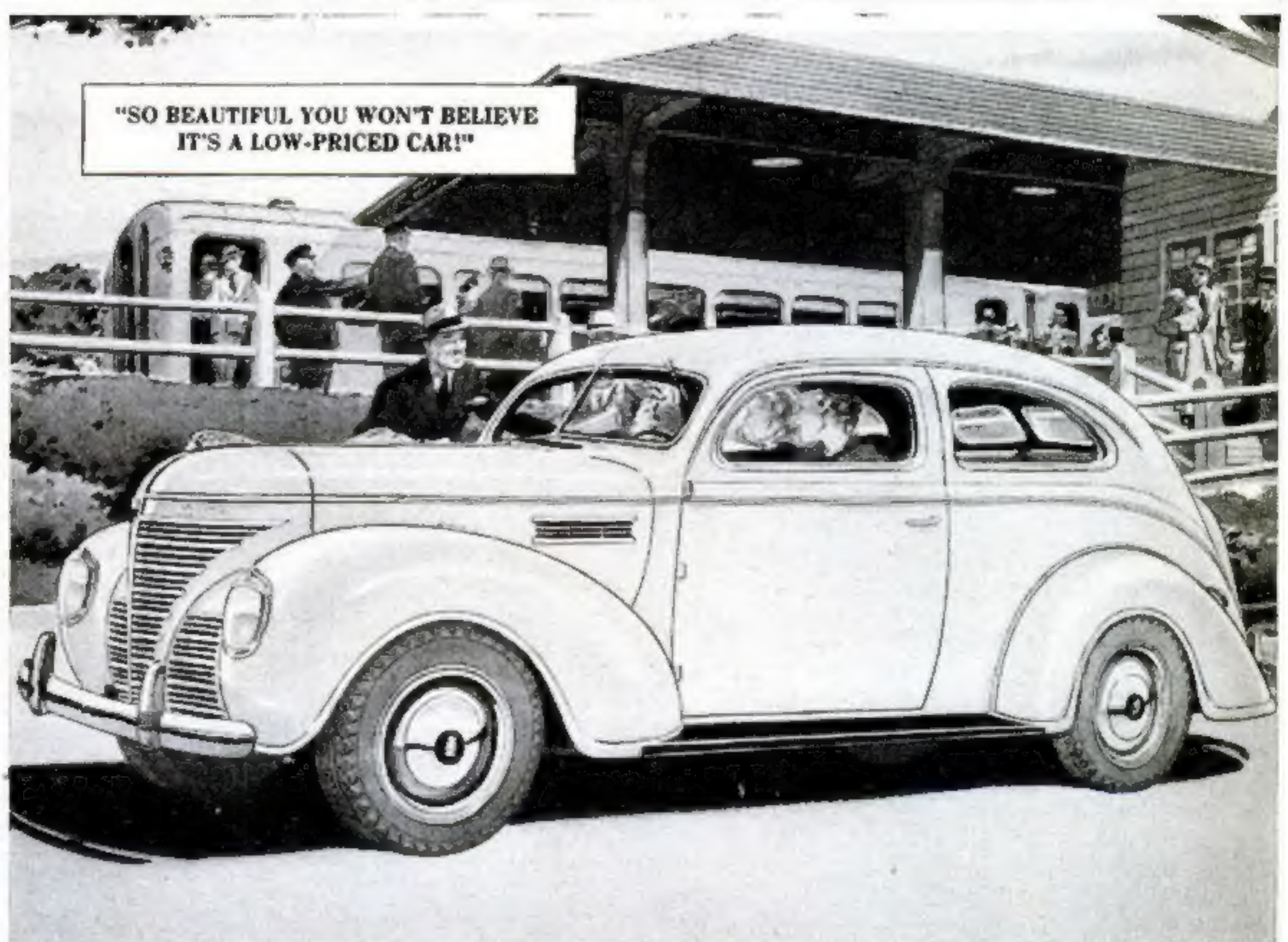
See your Plymouth dealer today! PLYMOUTH DIVISION OF CHRYSLER CORPORATION, Detroit, Michigan.

EASY TO BUY!

CONVENIENT TERMS

"Detroit delivered prices" include front and rear bumpers and bumper guards, spare wheel, tire and tube, foot control for headlight beam with indicator on instrument panel, ash-tray front and rear, sun visor, safety glass and big trunk space (19.3 cu. ft.). Plymouth "Roadking" models start at \$645; "De Luxe" models slightly higher. Plymouth prices include all federal taxes. Transportation and state, local taxes, if any, not included. See your Plymouth dealer for local delivered prices.

MAJOR BOWES' Amateur Hour, C.B.S. Network, Thurs., 9-10 P. M., E.S.T.



THE 1939 PLYMOUTH "ROADKING" Two-Door Touring Sedan...all-steel body completely rust-proofed.

PLYMOUTH BUILDS GREAT CARS

THE "ROADKING"
THE "DE LUXE"



CONTENTS [Continued]

Bar Replaces Door Chain.....	54
Light Metal Wall Studs.....	54
Automatic Electric Room Heater.....	154
Holder for Tooth Paste.....	154
Toaster Is Easy to Clean.....	154
Compact Electric Cooking Chest.....	154
Novel Dispenser for Mustard.....	154
Spillproof Drain Lid.....	155
Mixer Used in Teacup.....	155
Shoe-String Potato Cutter.....	155
Spiral Vegetable Slicer.....	155

MOVIES

Rubber Puppets for Animated Films..	84
Twin Mikes for Aviation Movies.....	90
World's Biggest Movie Screen.....	114
"Mint" Makes Stage Money.....	114
Movie Fish Trains Anglers.....	132
Big Light Gives Pin-Point Beam.....	147

NEW INVENTIONS

Automatic Paint Brush.....	22
Device Foils Slug Passers.....	22
Decoy Uses Dead Birds.....	22
Ice Straws Flavor Drink.....	22
Golf Teeing-Up Machine.....	22
New Machine-Gun Pistol.....	24
Improvement for Oil Cans.....	24
New Two-Piece Overalls.....	24
Shirt Covers Suspenders.....	26
Block Fits Any Size Hat.....	26
Canvas Basket Folds Up Flat.....	66
Head Band Keeps Sweat from Eyes...	66
Lawn Cleaner Grinds Up Leaves.....	71
Rays Kill Pup's Fleas.....	79
Glue Sticks Stop Stocking Runs.....	80
Submarine Plow Buries Cables.....	82
Handy Office Aid Nonskids Fingers...	82
Extension Cord Mounted on Reel.....	91
Cotton Picker Does Double Duty.....	91
Pocket Ash Tray for Smokers.....	92
Arc-Welding Kit for Amateurs.....	99
Adapter Unit for Electric Razors.....	106
Table Lamp Holds Newspaper.....	107
Electric Megaphone Aids Cops.....	107
New Football Golf Game.....	107
Nonskid Toe for Football Shoe.....	108
Hand Set for Television.....	115
Golf Bag Serves as Chair.....	117
Water Jacket Cools Midget Lamp.....	117
New Apronlike Football Pads.....	125
Animal Trap Prevents Escape.....	125
Battery Runs Electric Razor.....	127
Bracelet Holds Make-Up Kit.....	128
Kit Simplifies Etching.....	129
Electric Mixer Blends Paint.....	129
Tiny Razor for Women.....	133
Sun Lamp Marks Babies.....	135
Bomb Shelter Built Quickly.....	140
Tampering Jams Pickproof Lock.....	141
Musician Devises Double Harp.....	147
Gasoline Refined from Gas.....	252

PHOTOGRAPHY

Camera Makes "Streamline" Pictures	130
Film Viewer Clamps on Projector.....	130
Movie-Camera Case Opens Easily.....	131
New Drying Pads for Film.....	131
Improved Films for Miniature Cameras	131
Tiny Exposure Calculator.....	131
Who Invented the Miniature Camera?	134
Cut-Film Adapter for Camera.....	172
Focusing-Hood Extension.....	174
Laugh-Provoking Photograph.....	175
Covers for Developing Trays.....	232
Lens Added to Thermometer.....	232
Stove Polish Refinishes Camera.....	232
Soldering Iron Warms Developer.....	232
Basement Made into Darkroom.....	234
Substitute for Ground Glass.....	258
Burette Clamp Holds Camera.....	258

UNUSUAL FACTS AND IDEAS

Builds Organ in a Garage.....	66
Pea-Shooter Control Fires Torpedo....	67
Sidewalk Chats Are Televised.....	71
Swimmer Floats on Back To Eat.....	72
Gas Tank Resembles Giant Bubble.....	72
Safety Caravan Hauls Poison Gas.....	81
Alloy Runners for Ice Boats.....	84
Five-Mile Railroad Sold for \$301.....	92
Diver Collects Cash in Drive.....	93
Witness Stand Is Wired for Sound.....	93
Tells Tomorrow's Temperature Today	99
Corner Stone Is Made of Glass.....	109
Radio Waves Heat Rivet.....	109
Race Horse Gets Air Intake.....	115
Boy Chemist "Eats Up" Food Course	115
Motor Cycles Pull Modern Charioteer	116
Potato Skins Yield Cork Substitute....	117
Skeleton Pays Dividend—in Cash.....	122
Baskets Hamper Bicycle Racers.....	123
Tin Fish Is One-Man Submarine.....	124
Target Range Under Water.....	126
Electric Sheds Rid Cattle of Pests.....	133
Dummy Locomotive Fools Bombers....	133
Giant Relief Map of U. S.....	141
Hospital Planned for Ailing Fish.....	147
Chemist Solves Ancient Gem Mystery	148
Homemade Listening Device.....	148
Elevator Suits Golfers to a Tee.....	149
Capsize Boats in Odd Race.....	150
Clip Bees' Wings To Keep Them Home	151
Easy Tests Prove Scientific Laws.....	212

CRAFTWORK

Sea-Lion Sandwich Platter.....	161
Dinah, a Safety-Pin Holder.....	162
Saucy Bird Dispenses Twine.....	162
Burro Carries Pot of Cactus.....	163
Jig-Sawed Cowboy Caricature.....	163
Mexican Furniture for Dolls.....	164
Toy Furniture from Tin Cans.....	165
Moon Mirror Decorates Wall.....	166

GET THE FACTS ON—

3¢ Hospitalization Plan

**PAYS HOSPITAL
& SURGICAL FEES**

up to

\$325.00
A YEAR

Covers any man, woman or child anywhere in the United States. Permits selection of own hospital and surgeon.

**NO MEDICAL
EXAMINATION.**

WHAT do you know about Hospitalization Insurance? If you are not fully acquainted with the details, know how it pays hospital bills, expenses, surgeons fees for men, women and children, you owe it as a duty to yourself and family to get complete information. You can never tell when someone in your family will have to go to the hospital for sickness or emergency operation. Then it's comforting to know that proper care will be provided and burdensome bills paid by North American Mutual. Mail coupon today. Get complete details. See how easy it is for entire families to be protected. Important—North American Mutual employs no agents or collectors.



North American Mutual Hospitalization Plan at NO EXTRA COST provides for payment of hospital expenses **during confinement.** Choose any hospital.



NORTH AMERICAN MUTUAL LIFE Pays These BENEFITS Up To

\$150 Hospital Bills	\$150 Surgical Fees
\$90 Sanatorium	\$20 Operating Room
\$20 Anesthesia	\$10 X-Rays
\$10 Laboratory Examination	

Pays for more than 75 different operations. Coupon brings complete details, important for you to know.

MAIL THIS COUPON NOW

NORTH AMERICAN MUTUAL LIFE CORP.
Dept. PS Wilmington, Delaware 12-1
Please send, without obligation, complete information 3c A Day Hospitalization Plan.

Name _____

Address _____

City _____ State _____

CONTENTS [Continued]

Goofy-Bird Contest Regulations.....	167
Colonial-Design Candle Lamp.....	168
Linoleum Inlays for Craftwork.....	169
Easily Made Indian Tom-Tom.....	178
Rustic Hanger for Bird Cage.....	179
Ash Tray Turned from Piston.....	185
Rolling-Ball Game Amuses Boys.....	194

SHOP DATA FILE

Testing an Electric Flatiron.....	176
How to Lacquer Linoleum Floors.....	194
Speeds and Sizes of Pulleys.....	195
Identification of Nails.....	202

MODELS

Model Shows 200-Inch Telescope.....	83
Builds Miniature Ships in Bulbs.....	108
Roscoe Turner's Racing Plane.....	170
Easily Assembled Railway Layout.....	190
Tiny Tools Held in Pin Vise.....	191
Coal Chute for Model Railway.....	195
Manicure Set Used as Tools.....	202
Kits for Building Models.....	240

WOODWORKING

Early American Low Stand.....	180
Installing Modern Woodwork.....	182
Back Rest for Long Turnings.....	192
Walnut Dining-Room Chairs.....	196
Piano Stool Made into Table.....	262

NEW SHOP IDEAS

Heater for Waxes and Resins.....	176
Vacuum System Cleans Workshop.....	177
Plug for Machining Thin Tubing.....	178
Armature Rack Set at Angle.....	179
Improved Oilstone Mounting.....	189
Tape Holds Glass for Cutting.....	194
Sawdust Blower for Jig Saw.....	195
Sorting Tray Has Double End.....	202
Foundry Casts Soft Metals.....	203
Micrometer Tailstock Scale.....	205

Universal Tilting Shop Stand.....	206
Simple Jig for Cutting Screws.....	207
Teeth Filed in Back Edge of Saw.....	207
How to Make a Tap Cut Larger.....	207

HOME LABORATORY

Bottles Rest on Glass Casters.....	179
Table-Top Factories for Chemists.....	208
Easy Tests Prove Science Laws.....	212
Mechanical Microscope Stage.....	214

RADIO

Midget Transmitting Condenser.....	218
Radio-Phonograph on Casters.....	218
Unit Has Five Tuning Circuits.....	218
Radio Fits in Tight Quarters.....	219
Set Has Disappearing Dial.....	219
Control for Soldering Iron.....	219
Football Fan's Receiver.....	220
Radio Built in a Notebook.....	223

HINTS FOR THE HANDY MAN

Painting Platform for Windows.....	166
Workshop in a Clothes Closet.....	168
Old Grease Gun Caulks Cracks.....	176
Paint Reveals Markings on Rule.....	177
Jambs Undercut for Flooring.....	177
Wood Bit Tightens Brace Wires.....	177
Glycerin Renews Stamp Pads.....	178
Razor-Blade Tool Opens Boxes.....	179
Shelving Protected by Shade.....	181
Hooks Hold Up Electric Cords.....	185
How to Avoid Imperfect Wiring.....	186
Hooked Scraper Aids Recaning.....	188
Tube Diverts Water from Wall.....	188
String Shuts Off Alarm Quickly.....	188
Guards Prevent Loss of Rubbers.....	188
Spirometer Tests Lung Capacity.....	189
Guild Celebrates Fifth Birthday.....	199
Cover Hides Bathroom Cleanser.....	202
Tools Made from Auto Valves.....	205
Ideas for Gifts You Can Make.....	236
Old Bill Says.....	254

SHADOW OF A SUPERDREADNOUGHT!

NEW war vessels for the United States Navy are looming up behind guarded shipyard walls. Few details have been revealed, but beginning next month the Home Workshop Department will present a series of articles giving plans for making

simplified models of these ships. You'll get a big thrill out of building miniature super-dreadnoughts, such as the *Washington* shown at left, and other fighting craft. This is just one of the many construction and craft-work features on the schedule for January.



FOR AT LEAST ONE PLACE ON YOUR Gift List



FOR SISTER

How she'll enthuse over it as a stepping-stone to a college degree or a career!

FOR DAD

What a "kick" he'll get out of an Underwood Portable when he does his homework!



FOR JUNIOR

Who says typing's got writing beat a mile and proves it by putting more zest into studies.



NEW UNDERWOOD BUILT IN TYPING STAND

An ingenious collapsible stand perfected after many years of research. Built right into the Underwood TYPEMASTER Portable carrying case. Supplied exclusively on Underwood TYPEMASTER Portables.

\$750
EXTRA

*Furnished only with machine
—cannot be bought separately.*



THERE'S not a major gift in the shops that will put less strain on a Christmas pocketbook than an Underwood Portable. Think of it. You get delivery for as little as \$3.00 down (Student Model) with more than a year to pay the balance including a small carrying charge.

There's an Underwood Portable for every purse and purpose. Each is a full-fledged writing machine offering typical Underwood speed and durability. See your Underwood Dealer or mail the coupon . . . now.

Portable Typewriter Division
UNDERWOOD ELLIOTT FISHER CO.
Typewriters, Accounting Machines, Adding Machines, Carbon Paper, Ribbons and other Supplies
One Park Avenue, New York, N. Y.
Sales and Service Everywhere

Underwood
Portable Typewriter

Portable Typewriter Division
UNDERWOOD ELLIOTT FISHER CO.
One Park Ave., New York, N. Y.

Gentlemen: Please tell me all about the new Underwood Portables and convenient budget terms.

Name _____

Address _____

City _____

P. S. 12-88

Copyright 1938, Underwood Elliott Fisher Company

"IT WAS LIGHT IN A WILDERNESS

"I was stuck. A wife and three kiddies — and the same old pay envelope. I couldn't see a thing ahead except the same old grind. Then one day I read an I. C. S. ad. The coupon fascinated me. A new idea struck home — it was light in a wilderness of darkness to me! Today, because I mailed that coupon two years ago, I am a trained man — making a trained man's pay!"

Nearly fifty years ago, the International Correspondence Schools were established to provide sound educational facilities to men unable to attend resident schools. Over five million dollars have been spent in preparing textbooks and keeping them up-to-date. Today, you'll find I. C. S. graduates holding leading positions in every field of business and industry.

12 INTERESTING FACTS ABOUT THE WORLD'S LARGEST EDUCATIONAL SYSTEM

First student enrolled,
October 16, 1891

TOTAL ENROLMENTS

December 31, 1891.....	115
December 31, 1895.....	10,105
December 31, 1900.....	251,310
December 31, 1920.....	2,271,193
December 31, 1937.....	4,332,364

20,000 pieces of mail leave the I. C. S. daily.

Average daily postage bill on outgoing mail, \$500.

More than \$5,000,000 has been expended in preparing and improving I. C. S. textbooks.

More than 60,000,000 pages of printed study text are issued to students each year.

More than 500 colleges, universities and other resident schools have purchased and are using I. C. S. textbooks.

287 railroad companies and 2550 commercial and industrial estab-

lishments have made agreements with the I. C. S. for educating employees.

Colorado. Though confined to my bed through injury, I took the Colorado State Highway Dept. civil service examination and passed with marks sufficiently high to secure an appointment. I attribute this to I. C. S. training.
Robert P. Owens, Pueblo, Colo.

Oregon. I consider the training given by I. C. S. to be of the very best and recommend the I. C. S. method to any one desiring an education or wishing to review school or college subjects.
Oscar Cutler, Salem, Oregon

Missouri. Shortly after I enrolled with the I. C. S., I advanced to Layerout Foreman, then Chief Layerout, and at present I am Production Control man.
Lawrence E. Foster, St. Louis, Mo.

California. My I. C. S. training, plus experience, qualified me to plan larger building projects. The interior design of some of the larger rooms of the remodeled S. S. City of Honolulu was one of these.
J. Raymond Wyatt, Los Angeles, Calif.

Maryland. While studying your courses I advanced rapidly, and at present I am Industrial Engineer in the Baltimore plant of the Mutual Chemical Company of America in charge of methods and cost control.
H. L. Shipley, Baltimore, Md.

New Hampshire. I found the I. C. S. Salesmanship Course interesting and practical. It helped me derive the greatest benefit from 12 years' practical experience.
Arthur Fekas, Nashua, N. H.

Alabama. The Course gave me a better knowledge and understanding of the machinist's trade. Any man who applies himself to I.C.S. texts will get ahead.
Floyd C. Wright, Tuscumbia, Ala.

ICS

OF DARKNESS TO ME"

Maine. My I. C. S. Course enabled me to hold a day job and also to retain my seniority rights. I thank my I. C. S. instructors for their prompt and helpful interest. Harry F. Adams, Portland, Me.

Florida. I am more capable of carrying on my responsible duties as a result of my Traffic Management Course. Charles C. Barlow, Caryville, Fla.

Texas. I. C. S. home study and promotion go hand in hand. My own case proves it. I am in the testing laboratory of the biggest oil company in the U. S. I thank you for the help you've given me. James Robert Hicks, Jr., Houston, Texas

Illinois. The I. C. S. Course on P. A. Problems and Higher Accounting has paid me big dividends - especially the section on Federal Tax Accounting. Maxwell Wright, Wichita, Kan.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 7648-J, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

TECHNICAL AND INDUSTRIAL COURSES

- | | | | |
|--|--|--|--|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Sheet Metal Worker | <input type="checkbox"/> Commercial Refrigeration | <input type="checkbox"/> Surveying and Mapping |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Boilermaker | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting | <input type="checkbox"/> Bridge Engineer |
| <input type="checkbox"/> Building Estimating | <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation | <input type="checkbox"/> Bridge and Building Foreman |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio | <input type="checkbox"/> Air Conditioning and Cooling | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Steam Engineer | <input type="checkbox"/> Coal Mining |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Steam Electric Engineer | <input type="checkbox"/> Mine Foreman <input type="checkbox"/> Fire Bosses |
| <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Marine Engineer | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Patternmaker | <input type="checkbox"/> R. R. Locomotives | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> R. R. Section Foreman | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Welding, Electric and Gas | <input type="checkbox"/> Aviation Engines | <input type="checkbox"/> Air Brakes <input type="checkbox"/> R. R. Signalmen | <input type="checkbox"/> Agriculture |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Auto Technician | <input type="checkbox"/> Highway Engineering | <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Auto Electrical Technician | <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> Poultry Farming |

BUSINESS TRAINING COURSES

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Service Station Salesmanship | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> First Year College Subjects | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Spanish | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> College Preparatory |
| <input type="checkbox"/> Accountancy | <input type="checkbox"/> French | <input type="checkbox"/> Stenography and Typing | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> C. P. Accountant | <input type="checkbox"/> Advertising | <input type="checkbox"/> Railway Mail Clerk | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |

DOMESTIC SCIENCE COURSES

- | | | |
|---|---|--|
| <input type="checkbox"/> Home Dressmaking | <input type="checkbox"/> Advanced Dressmaking | <input type="checkbox"/> Foods and Cookery |
| <input type="checkbox"/> Professional Dressmaking and Designing | | <input type="checkbox"/> Tea Room and Cafeteria Management, Catering |

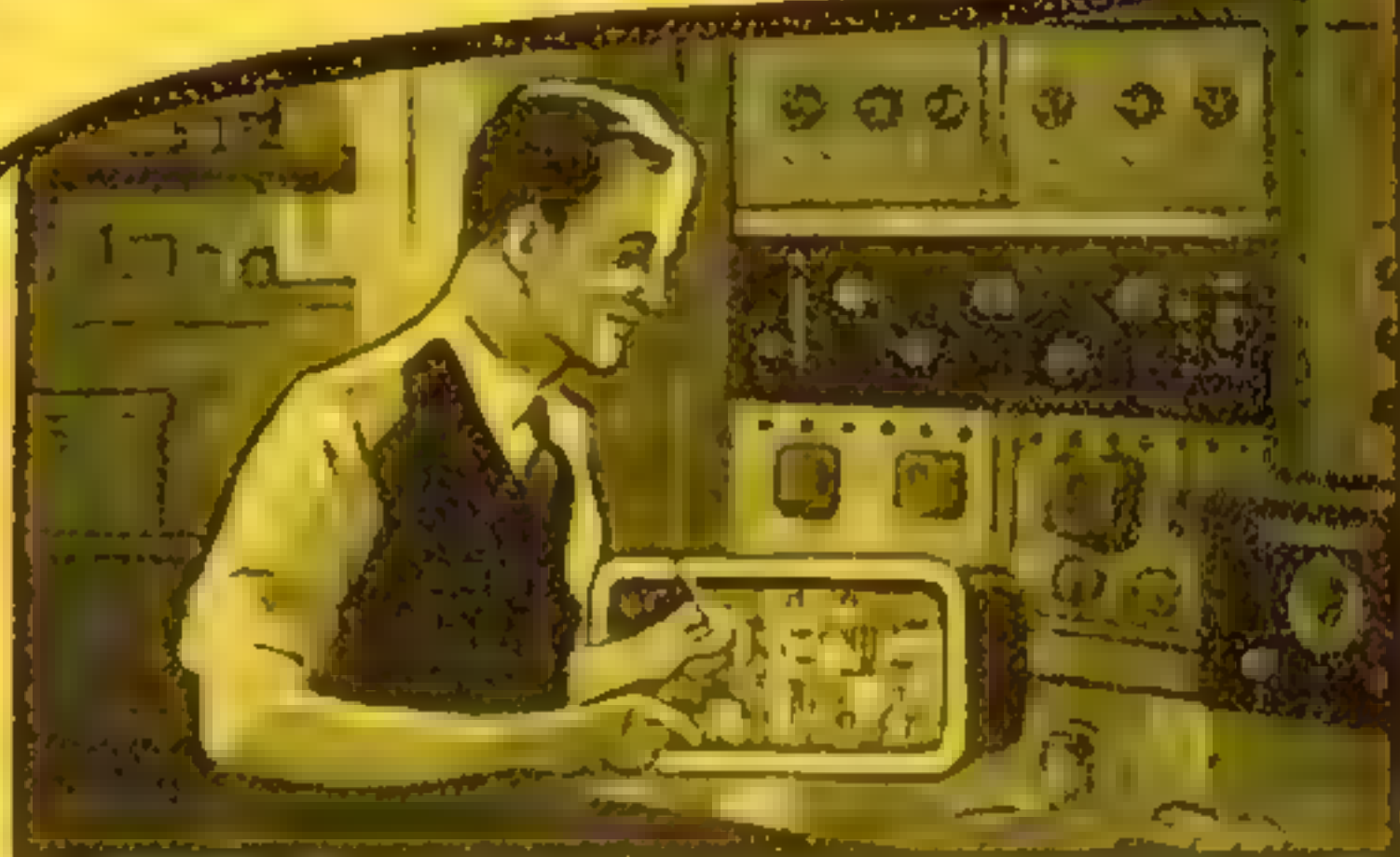
Name.....Age.....Address.....
 City.....State.....Present Position.....
 If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada
 If you reside in England, send coupon to I. C. S., 71 Kinway, London, W. C. 2, England

I Jumped from \$18 a week to \$50

--A FREE BOOK STARTED ME TOWARD THIS

Good Pay in Radio

--- HERE'S HOW IT HAPPENED
by S.J.E. (NAME AND ADDRESS SENT UPON REQUEST)



"When I finished training I accepted a job as serviceman with a Radio store. In 3 weeks I was made service manager at more than twice what I earned in the shoe factory."

BE A RADIO **Find out How I Train**

Radio offers you many opportunities for well-paying spare time and full time jobs. And you don't have to give up your job, leave home or spend a lot of money to train to get those jobs—to become a Radio Expert.

Many Make \$30, \$50, \$75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to \$5,000 a year. Fixing Radio sets in spare time pays many \$200 to \$500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as \$30, \$50, \$75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, and pay up to \$6,000 a year. Automobile, police, aviation, commercial Radio, loud speaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read how they got their jobs. Mail coupon.

How You Get Practical Experience

I send you special Radio equipment; show you how to conduct experiments, build circuits illustrating important principles used in modern Radio receivers, broadcast stations and loud-speaker installations. This 50-50 method of training—with printed instructions and working with

Many Make \$5, \$10, \$15 a Week Extra in Spare Time While Learning

The day you enroll. In addition to our regular Course I start sending Extra Money Job Sheets. Show you how to do Radio repair jobs. Throughout your training I send plans and directions that make good spare time money—\$200 to \$500—for hundreds, while learning

Over \$1,000 Before Graduating



"Before completing half the N. R. I. Course I was servicing sets, and I made \$1,000 to \$1,200 before graduating. I am doing Radio service work for myself now."—ASHLEY G. ALDRIDGE, 1228 Shepherd St., Petersburg, Va.

\$10 to \$25 a Week in Spare Time

"I am making from \$10 to \$25 a week in spare time while still holding my regular job as a machinist. I owe my success to N. R. I."—WM. F. RIPP, 203 West Front St., West Conshohocken, Pa.





"I had an \$18 a week job in a shoe factory. I'd probably be at it today if I hadn't read about the opportunities in Radio and started training at home for them."



"The training National Radio Institute gave me was so practical I was soon ready to make \$5, \$10, \$15 a week in spare time servicing Radio sets."



"Eight months later the N. R. I. Employment Department sent me to Station KWCR as a Radio operator. Now I am Radio Engineer at Station WSUI. I am also connected with Television Station W9XK."



"N. R. I. Training took me out of a low-pay shoe factory job and put me into Radio at good pay. Radio is growing fast. The field is wide open to properly trained men."

EXPERT You at Home

Radio parts and circuits—makes learning at home interesting, fascinating, practical. I ALSO GIVE YOU A MODERN, PROFESSIONAL ALL-WAVE, ALL-PURPOSE RADIO SET SERVICING INSTRUMENT to help you make good money fixing Radios while learning and equip you with a professional instrument for full time jobs after graduation.

Money Back Agreement Protects You

I am so sure I can train you to your satisfaction that I agree in writing to refund every penny you pay me if you are not satisfied with my Lessons and Instruction Service when you finish. A copy of this agreement comes with my Free Book.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL COUPON in an envelope, or paste on a postcard. NOW!

J. E. Smith, President, National Radio Institute, Dept. 8NP3, Washington, D. C.



J. E. SMITH, President,
National Radio Institute.
Established 1914

The man who has directed the home study training of more men for the Radio Industry than any other man in America



MAIL THIS NOW
Get 64 Page Book Free

J. E. SMITH, President, Dept. 8NP3,
National Radio Institute, Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio" which points out spare time and full time opportunities in Radio, and explains your practical method of training at home in spare time to become a Radio Expert. (Please write plainly.)

Name Age

Address

City State

Our Readers Say

Some Amateur Camera Fan Will Probably Do It!

THE new photographic films—fine-grain, panchromatic, and so on, with astonishing exposure latitudes that permit the camera fan to get away with errors of judgment for



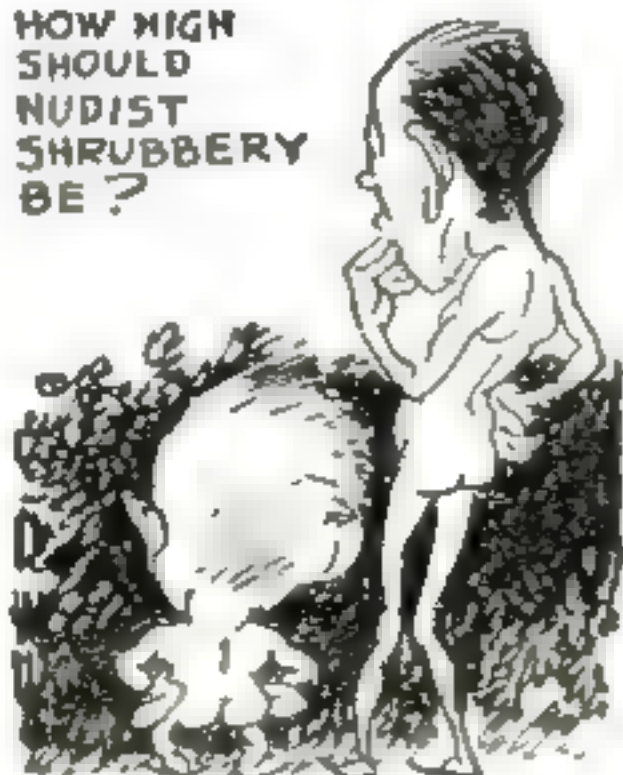
which he ought to get shot—are magnificent testimony to the genius of our photographic chemists and film makers. But I'd like to ask these photographic chemists one question. Why is it they haven't produced a film on which pictures can be made directly? By pictures, I mean pictures—not negatives. Then you

would be able to load your camera, make an exposure, develop the film, and have your finished positive, doing away with the irksome processes of transferring the film image to photographic paper. In short, why not make it so that we lazy amateurs can take our pictures on positive printing paper, directly?—S.A.R., Chicago, Ill.

Or Why Can't Somebody Grow a Roof-tree?

SEEING the picture of that freak tree, whose trunk had been tied in a knot when it was a seedling, gave me an idea which I gladly pass on to you and your readers for what it may be worth. Why doesn't some farsighted and enterprising nurseryman grow a batch of freak trees for the use of future generations. Thirty years from now, a tree that had grown up in the shape of a corkscrew, for example, could be sold at a premium to some future world's fair as a "theme" design—at least as sensible as some we've seen. Then, there would be the coil-spring variety for wheelbarrow handles so that lazy workers wouldn't wear themselves out under heavy loads. Or, by judicious twining of several trees, fine natural fences for nudist camps could be grown and sold at so much a yard, provided, of course, that they were free of knot holes. Seriously, now, opportunity is slipping through somebody's fingers!—N.L.S., Detroit, Mich.

HOW HIGH SHOULD NUDIST SHRUBBERY BE?



Great Oaks from Little Acorn Tubes Grow

WHEN radios were crystal sets, and crystal sets were twenty bucks, I bought my first copy of POPULAR SCIENCE because it went to great lengths to describe some of the early developments of a new doodad called a "vacuum value." Since then, I have accumulated a substantial file of back copies of the magazine, all with articles touching on the development of radio from a crackpot plaything to the mammoth industry it is today. P.S.M. still dishes out the right dope on the subject, and has now become a valuable supplement to our library here.—H.H., St. Paul, Minn.

Perhaps They Were Soft-Shell Clams

IT'S hard to imagine what that Montclair, N.J., fellow's distress must be when he tries to go to sleep with the allegedly noisy busses passing in front of his house. It must be terrific, to say the least, if he finds relative peace by strapping clamshells over his ears. Every time I've held them up to my ears—as who hasn't at some time or other to hear the noise?—I've been impressed by the quiet of ordinary man-made sounds. The sharp-edged shells must form comfortable pillows to rest a weary head on, too.—K.R.O., Austin, Tex.

HOW ABOUT COCONUT SHELLS?



A Step in the Right Direction Toward the Millennium

THAT exercising machine built into a couch, described in the November issue, is just another sign that we are getting closer to the millennium when the biggest effort of the whole day will be raising our eyelids after a hard night's sleep. Then, we'll be bathed, fed, instructed, amused, given our exercise, put in contact with our fellow men (or mice?), and so on, entirely through the magic of mechanical ingenuity, aided and abetted by radio and television. And when the end of the day comes, a gentle breeze (from an electric fan) will save us from the effort of closing our eyes by the simple expedient (Continued on page 14)

Why Trained Accountants Command

—and how ambitious men are qualifying
by the La Salle Problem Method

High Salaries

GET this straight.

By "accountancy" we do not mean "bookkeeping." For accountancy begins where bookkeeping leaves off.

The skilled accountant takes the figures handed him by the bookkeeper, and *analyzes* and *interprets* them.

He knows how much the costs in the various departments should amount to, how they may be lowered.

He knows what profits should be expected from a given enterprise, how they may be increased.

He knows, in a given business, what per cent of one's working capital can safely be tied up in merchandise on hand, what per cent is safe and adequate for sales promotion. And these, by the way, are but two of *scores* of percentage-figures where-with he points the way to successful operation.

He knows the intricacies of government taxation.

He knows how to *survey* the transactions of a business over a given period; how to show in cold, hard figures the progress it has made and where it is going. He knows how to *use* these findings as a basis for constructive policies.

In short, the trained accountant is the *controlling engineer* of business—one man business cannot do without.

Small wonder that he commands a salary two to ten times as great as that of the bookkeeper. Indeed, as an independent operator (head of his own accounting firm) he may earn as much as the president of the big and influential bank in his community, or the operating manager of a great railroad.

Some Examples

Small wonder that accountancy offers the trained man such fine opportunities—opportunities well illustrated by the success of thousands of

LaSalle accountancy students.* For example—one man was a plumber, 32 years old, with only an eleventh grade education. He became auditor for a large bank with an income 325 per cent larger.

Another was a drug clerk at \$30 a week. Now he heads his own very successful accounting firm with an income several times as large.

A woman bookkeeper—buried in details of a small job—is now auditor of an apartment hotel, and her salary mounted in proportion to her work.

A credit manager—earning \$200 a month—moved up quickly to \$3000, to \$5000, and then to a highly profitable accounting business of his own which netted around \$10,000 a year.

And What It Means to You

Why let the other fellow walk away with the better job, when right in your own home you may equip yourself for a splendid future in this profitable profession?

Are you really *determined* to get ahead? If so, you can start at once to acquire—by the LaSalle Problem Method—a thorough understanding of Higher Accountancy, master its fundamental principles, become expert in the practical application of those principles—this without losing an hour from work or a dollar of pay.

Preliminary knowledge of bookkeeping is unnecessary. You will be given whatever training, instruction or review on the subject of bookkeeping you may personally need—and without any extra expense to you.

If you are dissatisfied with your present equipment—if you recognize the opportunities that lie ahead of you through home-study training—you will do well to send at once for full particulars. The coupon will bring them to you without any obligation, also details of LaSalle's convenient payment plan.

Check, sign and mail the coupon NOW.



LaSalle Extension University

A Correspondence Institution

DEPT. 1283-HR

CHICAGO

Opportunities in Accountancy—Check below and we will send you a copy of "Accountancy, the Profession that Pays," without obligation.

☐ Higher Accountancy:

Other LaSalle Opportunities: If more interested in one of the other fields of business indicated below, check here:

- | | |
|--|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Commercial Law |
| <input type="checkbox"/> Modern Salesmanship | <input type="checkbox"/> Modern Foremanship |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Expert Bookkeeping |
| <input type="checkbox"/> Law: Degree of LL. B. | <input type="checkbox"/> C. P. A. Coaching |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> Stenotypy |
| <input type="checkbox"/> Credit and Collection | <input type="checkbox"/> Effective Speaking |
| <input type="checkbox"/> Correspondence | <input type="checkbox"/> Railway Accounting |

Name.....

Present Position.....

Address.....

*Names available on request.

Our Readers Say (CONTINUED)

of blowing them shut. Meanwhile, it's great to know that already the groundwork for the millennium is laid in the form of an exerciser that permits us to do our daily dozen without even getting up.—W.A.S., Boston, Mass.

Hurricanes Have His Head Spinning Two Ways

A FRIEND recently told me that hurricanes always whirl in one direction in the Northern Hemisphere and in the opposite direction in

YOU FORGOT THE LEFT-AND-RIGHT TWINING OF VINES! IDEA!



the Southern Hemisphere. He implied that this was caused in some way or other by the prevailing movement of the equatorial trade winds. And what's more, he claimed that whirlpools of water, even the tiny ones that are created in the drains of sinks and bathtubs as the water rushes

down, take the same whirling direction that the hurricanes do in their respective hemispheres, assuming that there are no other disturbing factors, such as the sink's design, to influence the motion. Now, I'll be darned if I can see how the trade winds can have any effect on the way the water runs out of my kitchen sink.—L.S., Troy, N. Y.

A Freewheeling Elephant Is a Dreadful Thought

As you study the animal kingdom, it seems as if nature has duplicated most of man's mechanical inventions, with two notable exceptions. So far as I know, no land animal travels on wheels, and no fish uses a screw propeller. Yet, it seems perfectly possible to imagine some structure that would serve the purpose.—J.F.K., Denver, Colo.

He Can't See Why We See Through Glass But Not Sand

AFTER trying several sources unsuccessfully to get a satisfactory answer to a question, I am passing it along in the hope that some of your readers may be able to help me out: What is the difference in the molecular structure of objects that are translucent, opaque, and transparent? You can take a material that is translucent or opaque and render it either temporarily or permanently transparent. You



can take such material as sand, which is opaque, and heat it to make glass, which is transparent. What I'd like to know is what happens to the molecular structure of these substances to cause such radical changes in their physical characteristics.—V.D.C., Chicago, Ill.

Old Rip Could Give Some Pointers to This Fellow

ONE of my friends recently brought up an interesting question. If you could go to sleep like Rip Van Winkle, and could decide beforehand just how long you would sleep, when would you want to wake up—ten years, 100 years, 1,000 years hence? What do your readers say? What future date

seems most interesting to them? What do they think science would have accomplished by then?—A.E., Philadelphia, Pa.



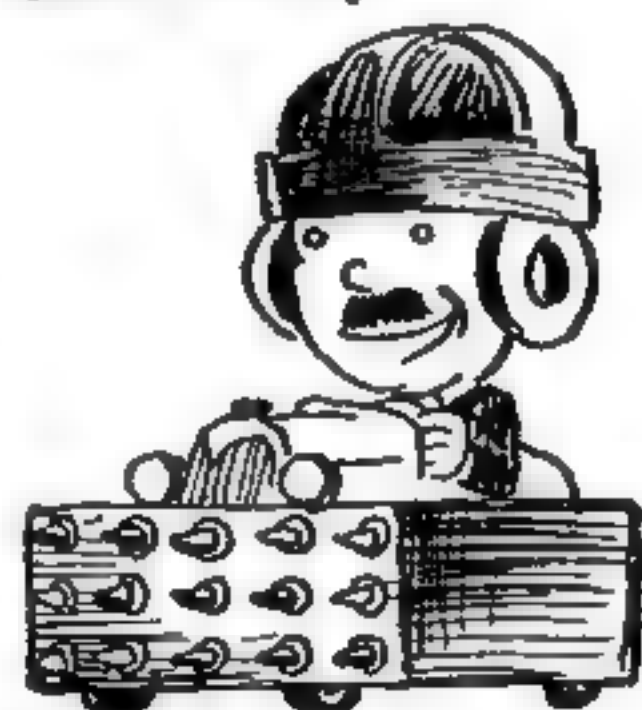
Would Dunkel's Parachute Scorch from Friction?

MY INTEREST was particularly aroused by your article on Joseph J. Dunkel's proposed parachute leap. When Mr. Dunkel is traveling at the terrific speed of 2,000 miles an hour and releases his first small parachute, isn't there a possibility of this parachute being scorched by friction that is sure to develop, thus causing it to fail to exert the necessary pull that is to open the larger chute?—T.J., Pine Bluff, Ark.

Reader Urges Control of That Bumper Crop of Bumper Attachments

WHEN will our automobile manufacturers wise up and make automobile bumpers wider, of uniform height (including truck bumpers), and hookproof, as well as strong enough to take it? Judging from the length of time it took them to design an adjustable driver's seat, I guess we motorists have a long wait ahead of us. These eleven—teen different styles of bumper attachments are fine—for the manufacturers who sell them. But a properly designed bumper would make them unnecessary to begin with. Let's have neat-looking, six-inch- (Continued on page 16)

HOW'S THIS?



You Ask Me What I Am Doing?



I Am Getting Ready to Earn More Money ... Preparing for a Bigger Job

I am a student of the American School, Chicago. A little more than half way through my course—already my increased knowledge has brought me promotion as a result of the hour or so a day I have been spending getting acquainted with the principles of the work I enjoy. I use only part of my spare time, so it doesn't interfere with my home and social life, and certainly helps me on the job.

I have been surprised at the practical manner in which even advanced work is explained. It is a lot easier than I had expected. I only wish I had started this plan of getting ahead a few years earlier. But when I was 18 to 20 I felt pretty sure of myself. I didn't take enough stock in what more experienced people told me about the importance of being thoroughly trained for the job I wanted.

You Can't Win If You Don't Try
American School, Dept. G946, Drexel Ave. at 58th St., Chicago

CUT ALONG THIS LINE

Try a Lesson Yourself—No Obligation

American School, Dept. G946, Drexel Ave. at 58th St., Chicago

I have checked the line of work in which I would like a good job. Please send me without expense or obligation on my part a copy of your Bulletin and an early lesson in the field I have selected.

- | | | |
|--|--|---|
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Law |
| <input type="checkbox"/> Architecture | <input type="checkbox"/> Diesel Engineering | <input type="checkbox"/> Liberal Arts (College) |
| <input type="checkbox"/> Automotive Engineering | <input type="checkbox"/> Drafting and Designing | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Automobile Repairing | <input type="checkbox"/> Electric Refrigeration | <input type="checkbox"/> Merchandising |
| <input type="checkbox"/> Bookkeeping and Cost Accounting | <input type="checkbox"/> Heating, Ventilating, Plumbing | <input type="checkbox"/> Private Secretary |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Professional Accounting Incl. C. P. A. Coaching | <input type="checkbox"/> Radio and Television |
| <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> High School | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Aviation | <input type="checkbox"/> Highway Engineering | <input type="checkbox"/> Shop Practice |
| <input type="checkbox"/> Contracting, Building | | <input type="checkbox"/> Steam Engineering |



Name _____ Age _____ Occupation _____

Street _____ City _____ State _____

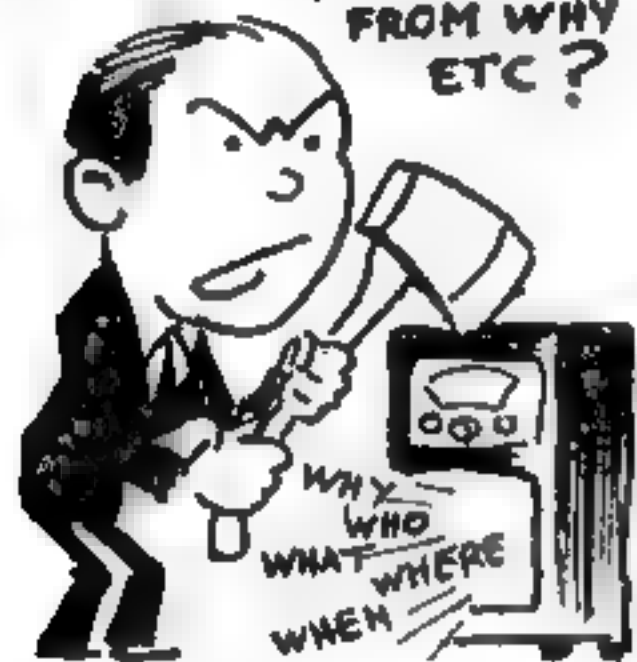
Our Readers Say (CONTINUED)

wide damageproof bumpers, strongly made, with the ends tucked in so they can't hook onto things (including pedestrians)! Heck, as they are now, they give almost as much trouble as service! I protest!—A.V., New York City.

This Is Something for the Readers To Decide

As a steady reader of "Readers Say," I can suggest only one thing to your contributors. They all sound off, humorously sometimes, other times seriously, on current affairs, articles you run, other readers' opinions expressed through the department, and their mathematical problems. How would it be to invite readers to submit questions, other than mathematical, which they cannot find satis-

WHY CAN'T WE HAVE A REST FROM WHY ETC?



factory answers for in qualified reference books. For example: Where did the expression "O.K." originate? What is the maximum height possible for a structure? Will the major oceans ever be tunneled? Will steam-driven automobiles come back? Could the U.S. raise its own rubber and coffee? A lot

of us would find answers for such questions. If they were kept brief enough, you might publish them in "Readers Say" and that department's reader interest would go even higher than it obviously is already.—N.S.P., Trenton, N.J.

But He Still Sets His Clock, Just To Be Sure

Do people have a "sixth sense" of time? I find that I often wake up just ahead—by five minutes or less—of the hour for which my alarm clock is regularly set. This morning it was so close that I was actually reaching out to disconnect the alarm when it went off. Now, is this simply a coincidence? Or does some physical "timekeeper," such as the pulsing of the blood, enable us to judge the passing of time?—A.D.F., Paterson, N.J.

Here's a Fellow Who Knows All the Answers

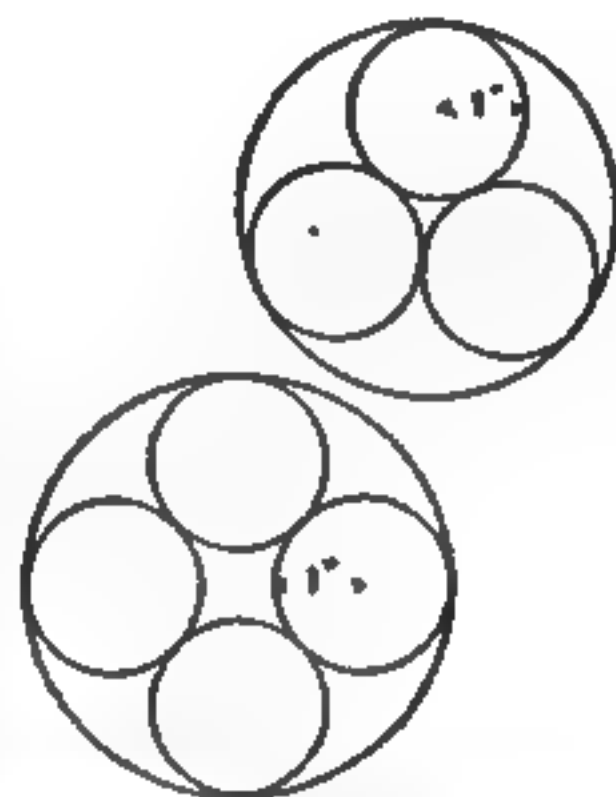
THE problem of the three circles submitted by E.R.S. in the September issue was a wow! You'll find that by connecting the centers of the three circles with lines, it is quite a simple matter to see two pairs of similar triangles. Each triangle is isosceles, each having a pair of equal sides (radii of circles, etc.). So the angles opposite the equal sides of each triangle are also equal. But in each of the pairs of triangles, it is obvious that there are opposite

interior angles which also are equal, so it can be proved from there that the line connecting the centers of the upper circles is parallel to AB in your diagram, by reason of the equal alternate interior angles. S.A.M.'s problem in the October issue was a nice one. I got A equals 1.886 inches, and B equals 3.264 inches. Oddly, the ellipse touches the sides of the triangle at their mid-points, and the center of the ellipse lies at the intersection of the medians.—R.T.C., Ann Arbor, Mich.

You'll Be Going Around in Circles Before Solving This

HAVE been reading your magazine for about ten years and sure find it the most interesting publication on the market. I've come across a problem that's stumped me, and I'm sure that among your readers there is some one who can help me out. Here is the problem: By how much area does the circle which circumscribes three tangent circles of one-inch radius differ from a circle circumscribing four tangent circles of one-inch radius? Here's wishing you the best of luck in your future issues of good old P.S.—

W.S.L., Jr., Bethlehem, Pa.



More Streamline Arguments Are Needed on This Matter

ALL this streamlining gets in my hair. As I see it, there is only one perfect shape for an automobile, one for an airplane, and one for a boat, and that is where the design presents the least resistance to motion through a given medium. Yet every inventor of a new vehicle tacks the descriptive adjective "streamline" onto the vehicle's name. According to their reasoning, there are a thousand ways of streamlining something. According to mine, the word "streamline" is absolute, like "unique," "bottom," or "tops," when we say "it's the tops." A thing can't be "uniquer," "bottomer," or "topser." Neither can it be "more streamline," according to my conception of the meaning of the word, and to the way my dictionary puts it, "when resistance to flow is *least possible*." (Italics are mine.) How do your readers feel about this?—A.R.I., Mobile, Ala.

WONDER IF MY DICTIONARY IS STREAMLINE!



Amazing New Oil Heater Invented by LACO



LOW AS \$23⁵⁰

Give This Practical Gift!

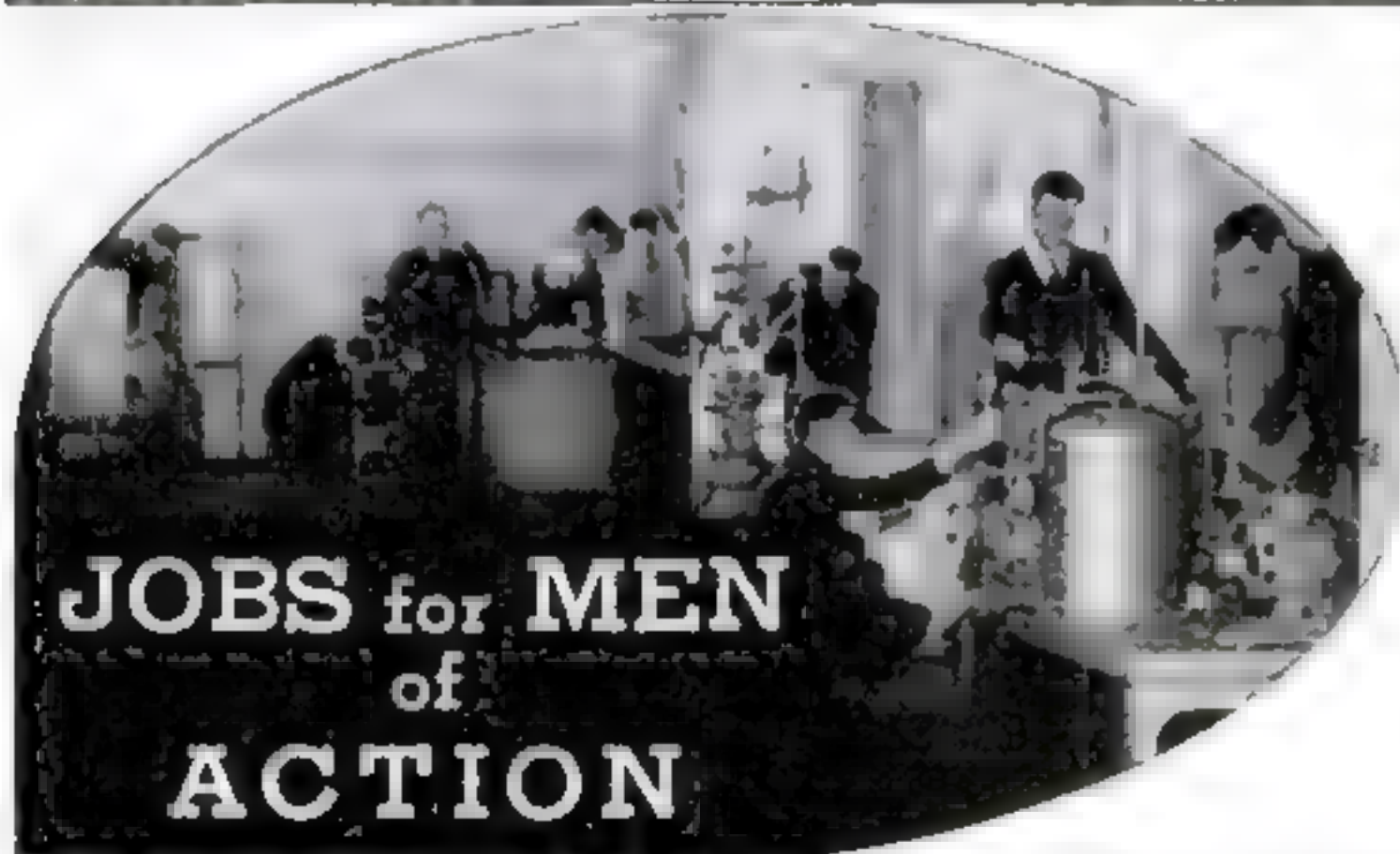


NOW—a sensational Low Price oil heater by LACO—delivers tremendous heat with little cost! Installs like a stove—needs no basement! Easy adjustment radiates as much or little heat as wanted. Ample volume for coldest days! Only LACO has the famous "Two-Stage Double-Flue" burner which develops amazing heat from little oil—and the "Inner Heating Unit" which utilizes utmost of the heat without waste. Enclosed in beautiful lifetime steel cabinet. Quiet! Safe! Circulates, humidifies the air. 4 sizes.

Save on LACO'S "Gun-Type" Burner
America's finest burner at the extremely Low Price! Simple (only 1 moving part.) Quiet. Uses little fuel (often cheaper than coal.) Exclusive "High Pressure Carburetor" transforms heavy oil into finest mist, produces extra rich mixture, extra hot flame. **GUARANTEED!**



WRITE Rush card for your copy of completely illustrated booklet giving complete details of my Very Low Priced LACO Heaters and Burners.
L. A. COCKLIN, Pres.
LACO OIL BURNER CO. 7128 Union Ave. Griswold, Iowa



JOBS for MEN of ACTION

U. S. Industries demand young men with combined technical commercial and real practical training.

CHOOSE YOUR OWN PLACE IN

Air Conditioning for Homes, or Commercial Installation and Service, Ventilating, Dairy Refrigeration, Transport Refrigeration, Sales, Research, or Executive Position.

35 YEAR OLD ORGANIZATION

Now receiving applications of men to prepare for good paying positions. No experience needed. We train you under actual working conditions. Every student given individual instruction in immense laboratories on 20th Century Air Conditioned Test Home. Co-operative Part-time work Plan. Earnest men of high character assisted to earn part expenses. Student Loans. Moderate training fee. Few industrial Scholarships awarded to men of outstanding merit. Don't be content with ordinary work and low pay when in a short time you can become a thoroughly trained Specialist in Air Conditioning.

GET FREE BOOK!



For details write O. Werwath, President.

MILWAUKEE SCHOOL OF ENGINEERING
Dept. P. S. 1238
Broadway and East State
Milwaukee, Wis.

MILWAUKEE SCHOOL of ENGINEERING
Institute of Electrotechnics

Without obligation send free booklet "Step Up to Success." Also tell me how I can become an Air Conditioning and Refrigeration Specialist in 3 mos. Air Conditioning Engineer (1 yr) Send details of Student Loan Industrial Scholarship Earn Part Expense
Name Age
City State
If interested in other courses, check here:
Electric Arc Welding Operator (3½ mos)
Welding Technician (4 mos)
Welding Engineer (1 yr)
Radio and Television Serviceman (6 mos)
Commercial Radio Engineer (1 yr)
Electrical Engineer (B.S. degree—4 yrs)
P.S. 1238

THIS COMPLETE, SIMPLE, PRACTICAL COURSE FOR SELF-INSTRUCTION WILL QUICKLY GIVE YOU

A Complete Mastery of MATHEMATICS



Prepare now to advance yourself to an important job by *Mathematics Training*. *Mathematics* is the foundation of all mechanical and scientific work, and of all business or industry based on science. Without this essential knowledge even the most capable man is left behind while others forge ahead to better jobs, bigger contracts, more money. You need mathematics to solve technical problems and to improve, speed up and check on your work and the work of others.

Now you can learn mathematics by an easy, inexpensive and time-saving method. A very simple and extremely interesting course in book form has been prepared for you by an expert who has devoted a lifetime to teaching practical men the fundamentals of this important subject.

MATHEMATICS FOR SELF-STUDY

By J. E. Thompson, B.S., A.M.,
Dept. of Mathematics,
Pratt Institute

These books start right from the beginning with a review of arithmetic that gives you all special short-cuts and trick methods that save countless hours of your time. Then they go right into higher mathematics and show you how simple it is when an expert explains it for you. In no time at all you will be tackling with ease the most difficult questions on this subject.

An Expert's Simplified Methods

Mr. Thompson, the author of these books, has had many years' experience in mathematical training. He presents each practical method and problem in the clearest, simplest way. He gets right down to the kind of information that you need in your daily work.

Send No Money—Mail This Coupon for FREE EXAMINATION

D. Van Nostrand Co., Inc., 250 Fourth Ave., New York
Send me **MATHEMATICS FOR SELF-STUDY** in 5 volumes.
Within 10 days I will either return the books or send you \$2.95 as first payment and \$2.00 per month for 3 months—total \$8.95 (5% discount for cash). (P.S.M. 12-38)

Name

Address

City and State

Reference

Address

☐ FOR FREE CATALOG of best books of practical instruction and technical information, check here. If you do not want **Mathematics for Self-Study** cross out paragraph above.

Please mention POPULAR SCIENCE when writing to advertisers.



AVIATION and POLICE RADIO offer Good JOBS

The nation's airlines are rapidly expanding. This means the creation of vast radiotelephone and radiotelegraph circuits that can be operated only by men with special training. Through the cooperation of men actually connected with several major airlines, Midland has developed an unusual plan of training that can fully qualify you for a fascinating, steady, well-paid job as an airline radio operator. All advanced instruction is under the supervision of expert operators employed by two major airlines. The many interesting subjects in addition to radio include operating procedure, weather, navigation, etc.



BILL FUHRMAN,
radio operator
employed by TWA



ARTHUR WOODS,
Midland-trained
radio operator,
employed by
Missouri State
Highway Patrol



GLEN BRADY,
Midland-trained
radio operator
employed by
Braniff Airways

NATIONAL POLICE Network

Day by day the life of the criminal is becoming more uncertain because of improved local and state Police Radio facilities. Here again, radiotelephone and radiotelegraph circuits are largely used. More and more cities and towns are joining the National Police Network. Police radio operators must have special training. To prepare you for this type of employment we have gone direct to police radio operators for our information. All instruction will be supervised by men actually connected with police radio systems. Midland's HI-SPEED COMMUNICATIONS training can prepare you for airline and police operating, broadcasting and many other branches of the radio field. Your employment opportunities will be excellent—you will be given genuine employment service upon graduation. **MIDLAND TRAINED MEN ARE ON THE JOB ALMOST FROM COAST TO COAST!**

Midland Aviation and Police training may be secured on two plans: 1. Combination Extension Resident. 2. Straight Resident.

Complete information about this new type of training will be sent you without obligation. Simply fill out the coupon and mail to us TODAY. This may be YOUR opportunity of a lifetime. **DON'T LET IT PASS YOU BY—Mail the coupon today!**

AVIATION-POLICE DIVISION

MIDLAND TELEVISION, INC.

28, 29, 30, 31st Floors Power & Light Bldg., Kansas City, Mo.

Affiliated with KMBC—
a Major Network Outlet.

GET THIS ILLUSTRATED Book
and complete information you want



Coupon Good for FREE Book!

Midland Television, Inc., Power & Light Bldg.
Dept. 304-M, Kansas City, Missouri
(Paste on postcard or mail in envelope)
Without obligating me, send your FREE illustrated
book on Aviation-Police Radio opportunities.

Name..... Age.....
Address.....
City..... State.....

ENGINEERING OPPORTUNITIES



A 104-page book that will
alter your entire outlook
and earning power.

The book explains clearly
and definitely many ways in
which a successful career
can be planned and follow-
ed, and outlines modern
Home Study courses in all
branches of Engineering.

"ENGINEERING OPPORTUNITIES" should be in your hands

Send for your copy now

AMERICAN INSTITUTE of ENGINEERING TECHNOLOGY, Inc.
Dept. S-1, 11 Hill Street, Newark, New Jersey

New York Electrical School

Established
1902

Ask for free booklet

40 West 17th St., N. Y. C.

ELECTRICAL EDUCATOR

LEARN ELECTRICITY—EASY AS A, B, C.
Key to theory and practice. Applications,
Rules, Calculations and Inside Informa-
tion on Maintenance and repair of Elec-
trical Appliances, Motors, Wiring, Light-
ing, Switchboards, Transformers, Bat-
teries, Armatures, Generators, Radio,
Ignition, Welding—1000 pages, 2000
diagrams—a reliable reference. Trouble
saving information. **AUDELS HANDY
BOOK OF PRACTICAL ELECTRICITY.**
Price \$4. Let us mail it to you for free
trial; pay \$1 a month if satisfied. Order today!
Theo. Audel & Co., 49 W. 23d St. New York, Dept. PSM

FREE "Air Conditioning" MAGAZINE

Write Today For Free Sample Copy

Supreme Publications, 3727 W. 13th St., Chicago, Ill.

ENGINEERING

TAUGHT TO YOU IN YOUR OWN HOME BY CONSULTANTS

Complete courses in Aeronautical, Chemical, Civil, Electrical, Metallurgical, and
Mechanical Engineering. Start your success program today. Write for particulars.
CINCINNATI ENGINEERING CORRESPONDENCE COLLEGE
Dept. B, Building Industries Bldg. Cincinnati, O.

EARN A DEGREE AT HOME

Home Study Courses leading to Degrees in Arts; Sciences; Philosophy; Education;
Public Health; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science;
Theology; Law; Agriculture; Business Training; Accounting; Statistics; Adv.
Sales; Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam,
Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum,
Marine, Refrigeration, Air Conditioning, Chemical Engineering. Founded 1908.
McKinley-Roosevelt Graduate College, 4211 Clarendon Ave., Chicago



ENCHANTING BEAUTY

By Alfred Cheney Johnston
Ziegfeld Follies Photographer

A RARE COLLECTION OF
UNRETOUCHED LIFE STUDIES

This magnificent volume contains nearly one hundred
full page photographs of the undraped female form to-
gether with a full technical article by Alfred Cheney
Johnston explaining his methods. "Enchanting Beauty"
measures 9½ x 12 inches. Each picture can easily be
detached for framing. The sale of this book is restricted
to adult artists, students and photographers.

Special Edition Price **\$3.75**

SEND FOR OUR FREE ILLUSTRATED BROCHURE
Enclose 10c to cover Postage and Handling

SWAN PUBLICATIONS, Inc., Dept. 55
RKO Bldg. Rockefeller Center New York, N. Y.

GET IN THE SWING with Slingerland . . . DRUMS



GENE KRUPA—World's Greatest Swing Drummer uses Slingerland

claimed the tops in smooth tone, easy playing, rich power by world's leading musicians. Easy payments, 5-days free trial. See at your dealers.

Cut this ad out—good for \$1.00 credit. Free special information on how to organize drum and bugle corps. Free Catalog—mention instrument wanted.

SLINGERLAND DRUM CO.
1319 Belden Avenue Chicago, Illinois

In Your Spare Time At Home LEARN MONEY MAKING CARTOONING

By easy Picture Chart Method. Teaches originality—the big need today. Former students include creators of "Terry & Pirates," "Out Our Way," "Winnie Winkle," etc. Don't wonder whether you have talent—rush name, address RIGHT NOW for FREE Sample Chart to test your ability and examples of work of former students earning \$50.—\$300. per week. Please state age.

THE LONDON SCHOOL
1432 National Bldg., Cleveland, Ohio.

GUITARS MANDOLINS

NOTHING CORNEY
about Slingerland Instruments

Compare the value—tone and power in Slingerland "Radio King" drums, banjos, guitars, mandolins, marimbas, or bugles—before you buy. Guaranteed more for your money. Ac-



MYSTERIOUS CHRISTMAS CARDS

A SENSATION—Sender's name appears, as if by magic—after card arrives. 25 clever cards 25 Matching envelopes, 1 Magic Pen and Bottle of Magic Name Fluid—all for \$1.00. Use them for yourself, also be an agent and make big money supplying friends. Rush \$1.00 for complete outfit, or send name for free sample with your name in magic fluid. Your money back with first order for 12 sets. Address

MAGICARD CO., Dept. 1312, Walnut Bldg., Des Moines, Iowa.

AIR CONDITIONING AND REFRIGERATION FREE TRIAL LESSON

Trained men needed. Good pay. Opportunities. Learn easily AT HOME in spare time (or at our Chicago School). Send for FREE TRIAL LESSON. No charge for this now or later. Write today.
CHICAGO TECHNICAL COLLEGE
S-331 Tech Bldg., 118 E. 26th St., Chicago, Ill.

Correspondence Courses in LOW AS RADIO and ELECTRICAL ENGINEERING \$25

ELECTRICAL ENGINEERING. Get good grasp of wide electrical field. Modern. Very understandable.
RADIO ENGINEERING. Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Tuition ONLY \$25, either course. Deferred payment plan. Experiment kits furnished. Write for free copies of school catalogs, student magazines, etc.
FREE LINCOLN ENGINEERING SCHOOL, Box 931-S12, Lincoln, Nebr.

MONEY for Talent!

BECOME A PROFESSIONAL ARTIST
If you have drawing talent, a large salary or a profitable business of your own can soon be yours. Learn commercial art at home through America's oldest and finest school. Forty years of successful teaching proves our ability. Write today for ART YEAR BOOK and full details. No obligation.

SCHOOL OF APPLIED ART
Dept. 398 10 E. Huron Street Chicago, Ill.



Learn AUTO Mechanics QUICKLY IN A FEW WEEKS

**Good-Pay Jobs
Are Available!**

Trained men earn top wages in these fascinating well-paying trades. This is not a correspondence school—no books—no lessons. Don't look for a job—**TRAIN FOR IT.** Read below how a McSweeney-trained man made good.

LEARN EASILY, QUICKLY:

- AUTO MECHANICS
- AVIATION MECHANICS
- DIESEL MECHANICS
- Collision Repair (Complete)
- Body and Fender Repair
- Auto Painting
- WELDING—Arc and Gas

You Get Actual Shop Training

Work on real equipment with real tools. In a few weeks you should be trained by actual work to hold down a Good Pay Job.

**We get
many letters
like this**

1801 E. 65th St., Cleveland, O. Dear Mac—Immediately after leaving school I went to work for United Motors and am now located in Cleveland where I hold a good position. I have been able to take care of the most complicated electrical jobs. I think I have done fine considering I had no experience before coming to your school.
—Hubert Todd

LEARN NOW—PAY LATER!

We will give you complete information on how to get your training now and pay for it later out of your earnings.

FREE Write today for Big Free Book. Get the facts about jobs; and low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in a few short weeks. Address Dept. 6-12.

McSWEENEY SCHOOLS

DETROIT, MICH. and KANSAS CITY, MO.
Write Our School Nearest You



DETROIT

In Big New McSweeney Buildings

The finest of their kind. Every modern facility for thorough instructions.



KANSAS CITY

McSWEENEY TRADE SCHOOL

Dept. 6-12, Detroit, Mich., or Kansas City, Mo.
Without cost or obligation send me your big FREE Book.

**I am interested
in the course on**

Name _____

Street _____

Town _____ State _____ Age _____

INVENTORS

ACT NOW TO PROTECT YOUR INVENTION WITH U.S. PATENT

OUR BIG BOOK TELLS YOU

The Importance of Quick Action

If you have a new idea that is patentable—and want to secure for yourself your inventor's sole right to profit from the idea—you can't afford to lose time in securing the protection of a U. S. Patent. Other inventors may be working on the same idea right now. Should they develop this idea and file patent application before you do—the burden of establishing priority will be upon you. Our Big Book—"Patent Guide for the Inventor"—will tell you the quickest possible way to secure Patent Protection for your idea. **SEND FOR IT TODAY!**

THE FIRST IMPORTANT STEP IN SECURING A PATENT

is to obtain the services of a Registered Patent Attorney. Establish the date of your invention as explained in our Book and disclose your idea to him in correct form. He then makes a SEARCH of the Patent Office Records and reports to you on existing U. S. Patents which might bear on your invention, giving his opinion on the advisability of proceeding and filing formal application. How this inexpensive step can save you money, time and delay when Patenting your idea—how it tells you whether or not it is worth your while to file formal Application—all is explained in our Big Book—Send for it TODAY. If you have developed some improvement, something which adds to the usefulness of any product—whether this product is Patented or not—you should protect your improvement with a Patent at once. Send for our Big Book which tells you how.

MANNER OF PROTECTION IS VERY IMPORTANT

When securing a Patent it is very important that the inventor's claims and objects be clearly set forth—so that protection is obtained on all important points of the idea. The U. S. Patent Office advises that you secure the aid of an experienced Registered Patent Attorney to prepare your statements—present your claims—and prosecute them in correct legal form. Our long experience, and the painstaking care with which we handle your Application, is assurance to you that our service is of the highest order, as described in our Big Book.

IF YOU WANT EXTRA-QUICK ACTION

If you do not want to wait until you have read our FREE Book—but want to start immediately to secure Patent Protection for your idea, send \$5.00 and rough drawings, details or a model of your invention to us today. Have these drawings and specifications dated—and witnessed! This small fee covers Search of the U. S. Patents, except in electrical, compound and process cases, to see if any conflicting Patent has been issued which would prevent you from obtaining a Patent. This also includes our advice to you on the next step you should take. But whatever you do, **Mail The Above Coupon For Our Free 48-Page Book And Free "Record of Invention" Form Right Now.**

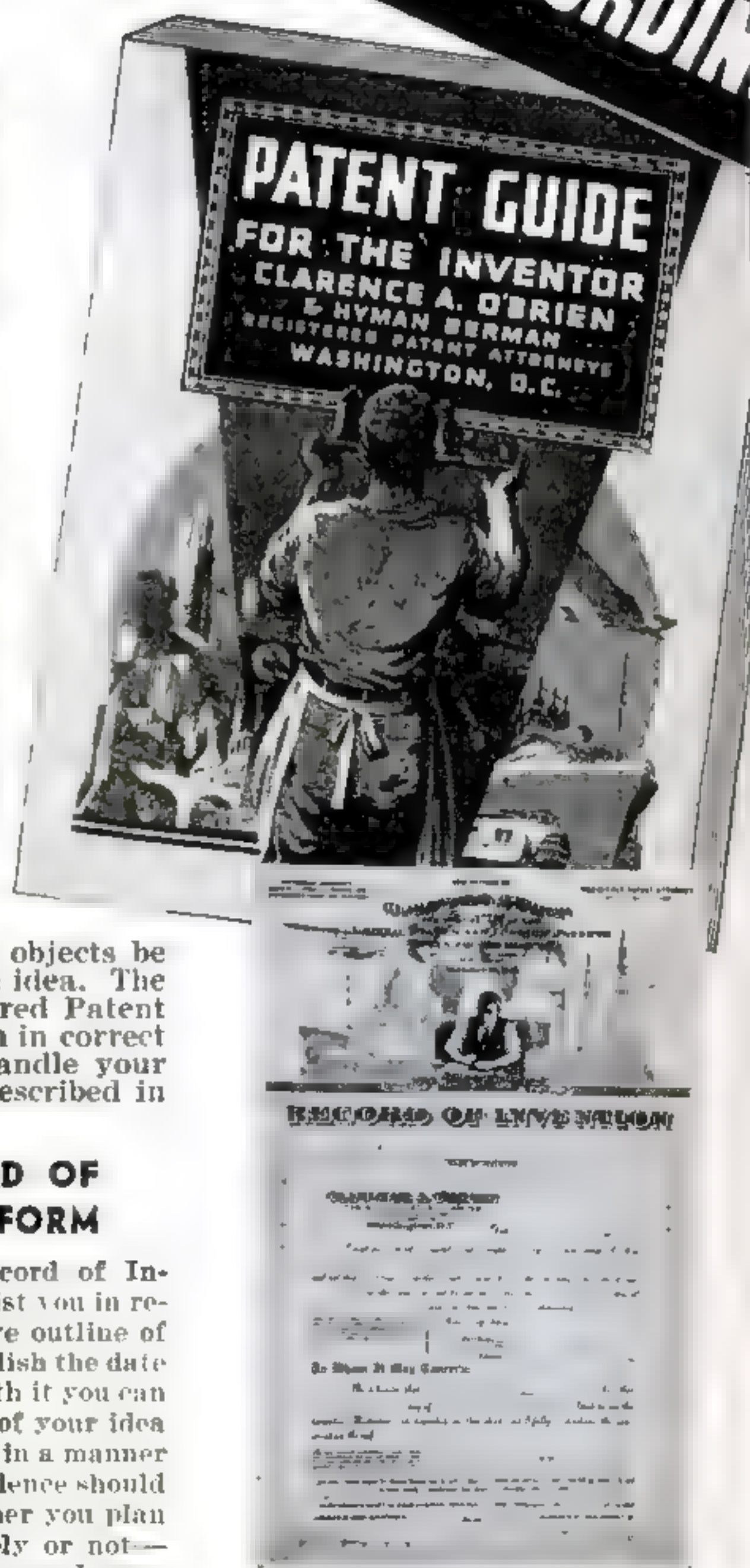
**CLARENCE A. O'BRIEN
and HYMAN BERMAN**

886 Adams Building Washington, D. C.
Registered Patent Attorneys Before U. S. Patent Office

**MAIL COUPON TODAY
FOR BIG**

FREE

**48 PAGE
FORM FOR RECORDING**



FREE RECORD OF INVENTION FORM

Use our FREE "Record of Invention" Form to assist you in recording the descriptive outline of your idea and to establish the date of your invention. With it you can make a rough sketch of your idea and have it witnessed in a manner of value to you, as evidence should occasion arise. Whether you plan to proceed immediately or not—get this Form, record your Invention, and have it witnessed.

You Can

PATENT

Small Ideas May Have Large Commercial Possibilities

Ideas do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all are simple yet familiar inventions—brought their inventors rich rewards. If you have a Patentable idea—act to protect it.

Send for our FREE 48-Page Book that tells you how.

**BOOK AND FREE
COUPON FOR OUR INVENTION**



**CLARENCE A. O'BRIEN
and HYMAN BERMAN**

886 Adams Building Washington, D. C.

Registered Patent Attorneys Before U. S. Patent Office

NEW IDEAS FOR IMPROVEMENTS IN MACHINERY, ARTICLES, DESIGNS, FORMULAS, ETC.

Every year thousands of Patents are granted. Very few, however, represent the discovery of entirely new principles. Most of them provide new methods of doing some every-day thing in a better way—changes for greater efficiency, usefulness, adaptability, or beauty in some previously Patented thing. These IMPROVEMENTS are Patentable if new, and actually represent new invention. These improvement Patents offer large chances for profit if commercially useful. The business world wants improved products and services.

MODELS AND FINISHED DRAWINGS UNNECESSARY

Our Big Book tells you how you can start immediately to apply for Patent Protection even if you haven't finished models or drawings available now. It will tell you how we can prepare the specifications and finished drawings necessary in the form prescribed by the Patent Office—so as to secure for you full Patent Protection. Mail Coupon for Our Big Book TODAY.

OUR SERVICES TO YOU

We are Registered Patent and Trade-Mark Attorneys, serving Inventors all over the United States and abroad. Our Organization is complete. We have Draftsmen, experienced Searchers and Attorneys to serve your interests. We can act as your legal adviser in all Patent Matters. Our complete service is described in Our Big Book. Mail Coupon for it NOW.

IN CASE YOU FEEL THAT YOU HAVE NOT SUFFICIENT FUNDS AVAILABLE FOR PATENT FEES

Our Big Book tells you how to legally assign an interest in your invention before filing application—to some friend willing to aid you. Better to do this than to delay indefinitely and see another inventor develop your idea and Patent it before you do. Send Coupon NOW.

REASONABLE FEES—CONVENIENT TERMS

Don't worry about finances. Our fees are very reasonable—we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office. See our Big Book for fees in obtaining Patent. It explains our arrangements clearly. Send for it NOW.

for quick action!

REQUEST OUR BOOK—NOW!

Know exactly what you should do to secure a Patent—what must be done every step of the way—how the Patent Law protects you—what we, as Registered Patent Attorneys, can do for you. Mail the coupon NOW for our Big Booklet and "Record of Invention" Form.

SEND TO-DAY

**CLARENCE A. O'BRIEN
and HYMAN BERMAN**

886 Adams Building, Washington, D. C.

Registered Patent Attorneys Before U. S. Patent Office

Please send me at once your Big Free 48-Page Book "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" Form. This request does not obligate me.

NAME.....

ADDRESS.....

CITY.....STATE.....

(Please write or print plainly)

COUPON

Device Foils Slug Passers



USING mirrors and prisms, Abraham and Joseph Weiss, of New York City, have devised a way to make coins dropped into pay telephones visible to an observer outside the booth. Designed especially to discourage the use of slugs in telephones, the arrangement provides a

display screen that is attached to the outside of a phone booth. When a coin is dropped into the telephone slot, its image is clearly visible on the screen.

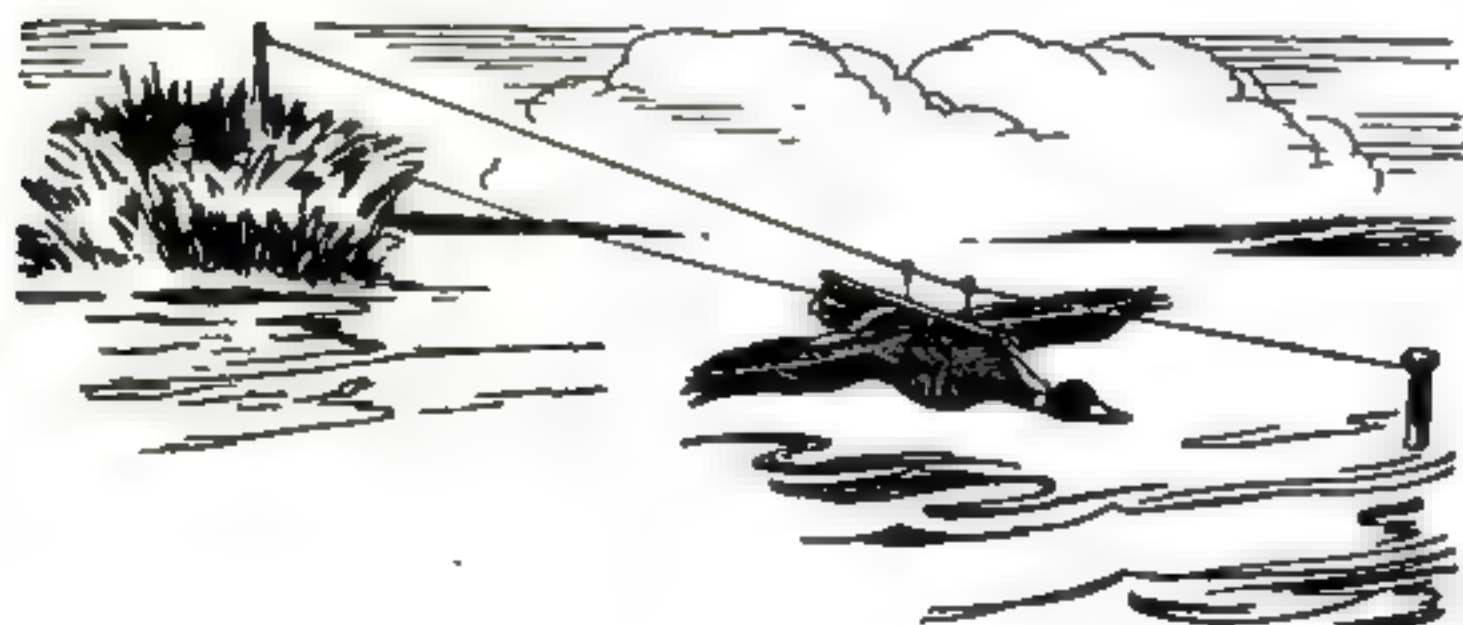
Automatic Paint Brush

PAINTERS using a novel "fountain-pen" brush developed by Hollis F. Mitchell, of Indianapolis, Ind., can paint without having to dip the brush periodically into a paint can. From a reservoir above the level at which the new brush is being used, paint flows through a flexible tube into the brush's hollow handle and down to the bristle tips. A valve in the brush handle controls the flow of paint.



Decoy Uses Dead Birds

BIRDS already shot by hunters make lifelike decoys to lure other birds into shotgun range, with the use of a novel apparatus recently invented. A metal harness holds a dead bird in flying position as it travels on rollers down a taut line between the hunting blind and a post set in the water about ninety feet away. After the bird has "glided" to a landing, a control string is pulled to fold its wings and lift its head in a natural position.



Trucks Cut Vertical Pipe

ANY large-diameter pipe set in the ground is quickly severed by a friction process originated by Russell C. Showalter, of Oklahoma City, Okla. From a revolving drum mounted on the back of one truck, a flexible line runs around the upright pipe and then continues at an angle to a second drum mounted on another truck, as shown in the illustration. Heavy weights are attached to the line to assure uniform tension. As the drums move the line back and forth from one truck to the other, frictional contact with the pipe severs it at the desired point.

Ice Straws Flavor Drink

BEVERAGES are flavored and iced at the same time when sipped through a new-type drinking straw. The straw is designed so that when it is used, the beverage passes up through a soluble, frozen flavoring material within the body of the straw. The

straws are kept on ice until time for use.



Golf Teeing-Up Machine

GOLF balls are automatically teed up for driving by an ingenious practice aid. From an underground container, golf balls are released down a runway, one at a time, by a foot lever. When the lever is released, a ball is forced up through a tube by a spring-actuated plunger to assume a conventional position above ground for driving with a golf club.



A Money-Making Opportunity for Men of Character

EXCLUSIVE FRANCHISE FOR
AN INVENTION EXPECTED TO REPLACE
A MULTI-MILLION-DOLLAR INDUSTRY

Costly Work Formerly
"Sent Out" by Business Men
Now Done by Themselves
at a Fraction of the Expense

This is a call for men everywhere to handle
exclusive agency for one of the most
unique business inventions of the day.

Forty years ago the horse and buggy business was supreme—today almost extinct. Twenty years ago the phonograph industry ran into many millions—today practically a relic. Only a comparatively few foresighted men saw the fortunes ahead in the automobile and the radio. Yet irresistible waves of public buying swept these men to fortune, and sent the buggy and the phonograph into the discard. So are great successes made by men able to detect the shift in public favor from one industry to another.

New another change is taking place. An old established industry—an integral and important part of the nation's structure—in which millions of dollars change hands every year—is in thousands of cases being replaced by a truly astonishing, simple invention which does the work better—more reliably—AND AT A COST OFTEN AS LOW AS 2% OF WHAT IS ORDINARILY PAID! It has not required very long for men to have taken over the rights to this valuable invention so do a remarkable business, and show earnings which in these times are almost unheard of for the average man.

Not a "Gadget"—
Not a "Knick-Knack"—

but a valuable, proved device which
has been sold successfully by busi-
ness novices as well as seasoned
veterans.

Make no mistake—this is no novelty—no flimsy creation which the inventor hopes to put on the market. You probably have seen nothing like it yet—perhaps never dreamed of the existence of such a device—yet it has already been used by corporations of outstanding prominence—by dealers of great corporations—by their branches—by doctors, newspapers, publishers—schools—hospitals, etc., etc., and by thousands of small business men. You don't have to convince a man that he should use an electric bulb to light his office instead of a gas lamp. Nor do you have to sell the same business man the idea that some day he may need something like this invention. The need is already there—the money is usually being spent right at that very moment—and the desirability of saving the greatest part of this expense is obvious immediately.

Some of the Savings
You Can Show

You walk into an office and put down before your prospect a letter from a sales organization showing that they did work in their own office for \$11 which formerly could have cost them over \$200. A building supply corporation pays our man \$70, whereas the bill could have been for \$1,600! An automobile dealer pays our representative \$15, whereas the expense could have been over \$1,000. A department store has expense of \$88.60, possible cost if done outside the business being well over \$2,000. And so on. We could not possibly list all cases here. These are just a few of the many actual cases which we place in your hands to work with. Practically every line of business and every section of the country is represented by these field reports which hammer across dazzling, convincing money-saving opportunities which hardly any business man can fail to understand.

Profits Typical of
the Young, Growing Industry

Going into this business is not like selling something offered in every grocery, drug or department store. For instance, when you take a \$7.50 order, \$5.83 can be your share. On \$1,500 worth of business, your share can be \$1,167.00. The very least you get as your part of every dollar's worth of business you do is 67 cents—on ten dollars' worth \$6.70, on a hundred dollars' worth \$67.00—in other words two thirds of every order you get is yours. Not only on the first order—but on repeat orders—and you have the opportunity of earning an even larger percentage.

This Business Has
Nothing to Do With
House to House Canvassing

Nor do you have to know anything about high-pressure selling. "Selling" is unnecessary in the ordinary sense of the word. Instead of hammering away at the customer and trying to "force" a sale, you make a dignified, business-like call, leave the installation—whatever size the customer says he will accept—at our risk, let the customer sell himself after the device is in and working. This does away with the need for pressure on the customer—it eliminates the handicap of trying to get the money before the customer has really convinced himself 100%. You simply tell what you offer, showing proof of success in that customer's particular line of business. Then leave the invention without a dollar down. It starts working at once. In a few short days, the installation should actually produce enough cash money to pay for the deal, with profits above the investment coming in at the same time. You then call back, collect your money. Nothing is so convincing as our offer to let results speak for themselves without risk to the customer! While others fail to get even a hearing, our men are making sales running into the hundreds. They have received the attention of the largest firms in the country, and sold to the smallest businesses by the thousands.

EARNINGS

One man in California earned over \$1,600 per month for three months—close to \$5,000 in 90 days' time. Another writes from Delaware—"Since I have been operating (just a little less than a month of actual selling) and not the full day at that, because I have been getting organized and had to spend at least half the day in the office; counting what I have sold outright and on trial, I have made just a little in excess of one thousand dollars profit for one month." A man working small city in N. Y. State made \$10,805 in 9 months. Texas man nets over \$300 in less than a week's time. Space does not permit mentioning here more than these few random cases. However, they are sufficient to indicate that the worthwhile future in this business is coupled with immediate earnings for the right kind of man. One man with us has already made over a thousand sales on which his earnings ran from \$5 to \$60 per sale and more. A great deal of this business was repeat business. Yet he had never done anything like this before coming with us. That is the kind of opportunity this business offers. The fact that this business has attracted to it such business men as former bankers, executives of businesses—men who demand only the highest type of opportunity and income—gives a fairly good picture of the kind of business this is. Our door is open, however, to the young man looking for the right field in which to make his start and develop his future.

No Money Need Be Risked

in trying this business out. You can measure the possibilities and not be out a dollar. If you are looking for a business that is not overworked—a business that is just coming into its own—on the upgrade, instead of the downgrade—a business that offers the buyer relief from a burdensome, but unavoidable expense—a business that has a prospect practically in every office, store, or factory into which you can set foot—regardless of size—that is a necessity but does not have any price cutting to contend with as other necessities do—that because you control the sales in exclusive territory is your own business—that pays more on some individual sales than many men make in a week and sometimes in a month's time—if such a business looks as if it is worth investigating, get in touch with us at once for the rights in your territory—don't delay—because the chances are that if you do wait, someone else will have written to us in the meantime—and if it turns out that you were the better man—we'd both be sorry. So for convenience, use the coupon below—but send it right away—or wire if you wish. But do it now. Address

F. E. ARMSTRONG, President
Dept. 4052-N, Mobile, Ala.

RUSH FOR EXCLUSIVE TERRITORY PROPOSITION

F. E. ARMSTRONG, Pres., Dept. 4052-N, Mobile, Ala.
Without obligation to me, send me full information on your proposition.

Name _____
Street or Route _____
Box No. _____
City _____
State _____

TOP PAY FOR TRAINED MEN

Learn AIR CONDITIONING and REFRIGERATION

Air Conditioning and Refrigeration—America's newest Industries—are growing by leaps and bounds. Each day new opportunities for top-pay await the trained man. You can qualify. NOW you can learn practical Air Conditioning-Refrigeration at home, under the personal guidance of expert engineers. National Schools have made revolutionary progress in bringing a complete, proven Course to ambitious men.

Amazingly different

Not to be confused with ordinary correspondence courses, National Schools' plan brings you combined home-training and actual shop experience.

**START at home
FINISH in California**

National's successful plan enables you to master preliminary training while you are at home working, thereby saving time and money. Later, you come to School for final intensive SHOP-PRACTICE instruction which qualifies you for big pay jobs. Only a residential School, such as National, can offer this kind of training—the result of 33 years of continuous testing. You can start right now. After your home study is completed we provide your roundtrip transportation to Los Angeles. (From any point in U. S.)

FREE BOOK gives details.

Lose no time. Investigate. Mail the Coupon as your first step toward assured success and good pay for life in the Air Conditioning-Refrigeration Industries. Free Book gives complete details.

NATIONAL SCHOOLS

Los Angeles (Est. 1905)

REQUEST FOR FREE BOOK

National Schools, Dept. PSC 12
4000 So. Figueroa St., Los Angeles, Calif.

NAME _____ AGE _____

ADDRESS _____

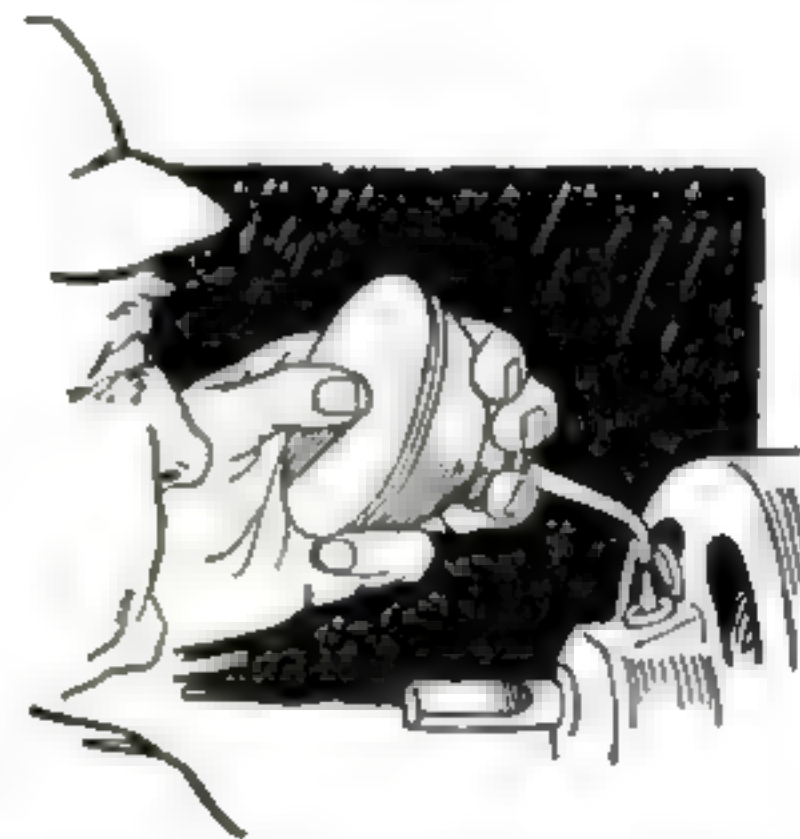
CITY _____ STATE _____

New Machine-Gun Pistol

CAPABLE of holding up to fifty shells, a new machine-gun pistol has a magazine under the barrel that holds shells side by side in a spiral channel fitted with a spring mechanism for forcing them into the firing chamber. One shell may be fired at a time, or all may be fired in rapid succession, with one pull of the trigger. The firearm is the invention of Herman J. Kobe, of Bryan, Ohio.



Improvement for Oil Cans



WHEN oil gets low in an ordinary oil can, it is impossible to force it out through the spout unless the can is tipped up almost vertically. A new-type can originated by Carl Leonard, of Wakefield, Nebr., eliminates this

difficulty by having the inner end of the spout extend down to the bottom edge of the can.

New Two-Piece Overalls

WORKMEN will waste no time getting in or out of two-piece overalls fitted with slide fasteners by a method Hyatt Lemoine, of Maywood, N. J., proposes. As indicated in the illustration, a workman removing his overalls pulls the metal slider up from the trousers, turns it at right angles and pulls it in a horizontal direction around his waist, and then turns it once more to open the jacket.



THESE FREE BOOKS ARE FOR INVENTORS

AND OTHER MEN WITH IDEAS

**"We're only entering the great period
of inventive advancement"**

—says C. F. Kettering, Vice Pres., General Motors.

SOMETIMES we hear people say: "Well, there isn't much left to invent." But Charles F. Kettering, Vice-Pres. and head of Research of General Motors, who helped develop the self-starter, Duco and many other outstanding inventions, doesn't think that at all. Not long ago in a published statement, he said:

"If we took half the men employed in tool making and put them to working out new inventions, new things, we could snap out of this depression in no time. Our return to normal times depends on new manufactured products that will catch the purchaser's eye, get him to buy and thus start the ball rolling. Change and buying go together. *We are only entering the great period of inventive advancement.*"

Many Little Ideas Have Big Commercial Possibilities

Some of the world's best inventions came from men who didn't consider themselves inventors at all. The telegraph was invented by a painter, the typewriter by a farmer, the hand camera by a bank-clerk, the stock ticker by a dentist. Or look at small inventions. A husband noticed his wife bending a hair pin to make it stay put. That gave him the idea of the crinkly hair pin. One day a golfer got the idea to make a wooden tee. Now wooden tees are sold by the millions every year. There are many similar examples in inventive history. That is why we say that the books shown here are for INVENTORS and Other Men with IDEAS. Whether you consider yourself an inventor or not—if you have an idea that will make money, save time, save labor, or give pleasure—find out how you can protect your rights to it.

Our Business Is to Help You

For forty years, this organization has been in the business of helping inventors. During that time inventions from every corner of the country have been turned over to us to protect. Some ideas have represented complicated mechanisms; others have been small, practical articles, like a can opener or a new toy. All this has given us a wealth of experience to use for the inventor of today. Here in Washington, we maintain a large staff of experienced Patent Specialists to give you prompt and expert service. Yet because we work efficiently—our fees are low, and if desired we help you with deferred payments. But first, find out exactly what to do to protect yourself. Decide on that today by sending for your FREE copies of the books shown above.

Suggestions
on
WHEN
and
HOW
to Sell an
INVENTION

THESE BOOKS TELL YOU:

How the Patent Laws protect an inventor. Simple steps to take promptly, without cost, to claim your right to your idea. Kind of sketch or model needed. How you can go about selling an invention. They are full of valuable facts, simple, easily understood suggestions and interesting bits of inventive history. We gladly send them to serious men. No charge, no obligation. Write us or use the coupon below. Get that much done today.

**PATENT
PROTECTION**

VICTOR J.
EVANS & Co.

REGISTERED PATENT ATTORNEYS
MAIN OFFICE: 10-P, VICTOR BUILDING
WASHINGTON, D. C.

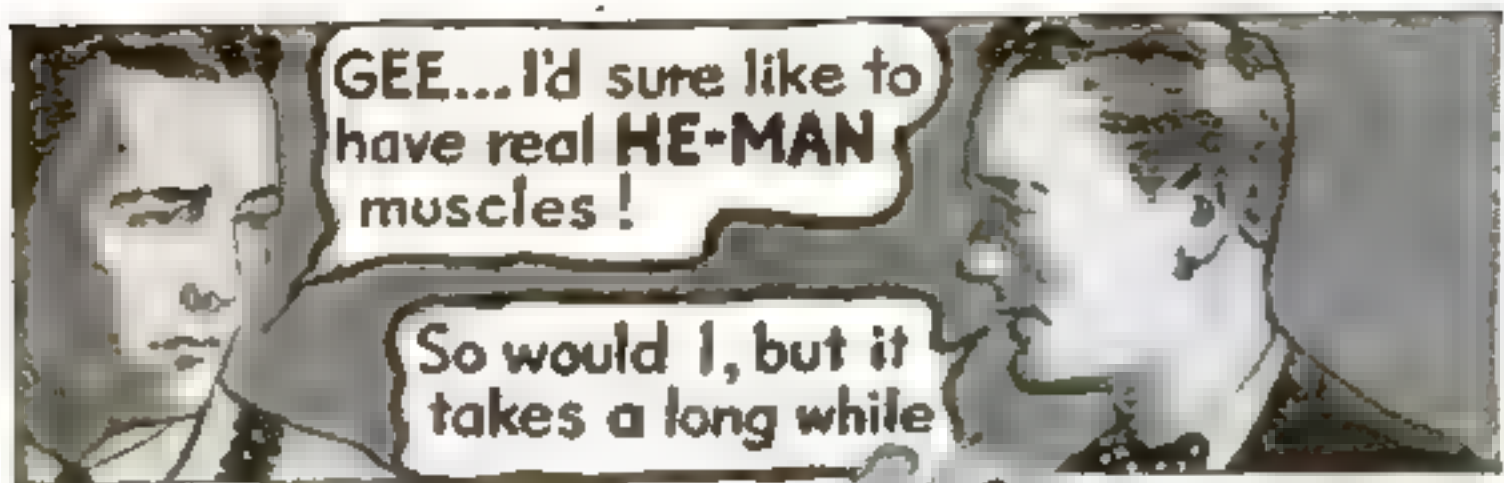
OTHER OFFICES: 514-C, Empire Bldg., Pittsburgh
405-C, Garfield Bldg., Los Angeles
1010-C, Hobart Bldg., San Francisco

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention."
(Note: Same books supplied by any of the branch offices listed above.)

Name.....

Street and No.....

City or Town..... State.....



—says Charles Atlas
Holder of title, "World's
Most Perfectly Developed
Man" won in National and
International Contests.

"Bunk!"

**I'll Prove in
the first 7 days
YOU can have a
Body like Mine!"**

DON'T get the idea that it takes a lot of time and hard work for you to get smashing strength and powerful muscles! Don't think you need dumb-bells, springs or other contraptions! Both these ideas are all bunk—and I have **PROVED** it. All I need is 7 days to prove what I can do for you! And I don't need any apparatus either. In fact, I don't believe in artificial methods that may strain your vital organs for life!

NATURAL Methods Are All I Need

Here you see an actual photo of how I look today. No muscles have been "painted on." This is the camera's honest proof of what I did for MY body. Now I'm ready to prove what my secret of Dynamic Tension can do for YOURS!

A few years ago I was a physical wreck, a 97-pound weakling—flat chested, arms and legs like pipestems. I was worried. I studied myself. Then I found a new way to build myself up. A way that was simple, natural, quick and sure! "Dynamic Tension" is what I called it. In a short time I had the body that has twice won the title of "The World's Most Perfectly Developed Man."

Get My FREE Book

Thousands of others now know from their own personal experience what Dynamic Tension has done for them.

This little coupon brings you my free book, which tells all about it. No cost or obligation.

I just want to give you proof that I can do for you what I have done for so many others; give you broad, powerful shoulders, biceps that bulge with smashing strength, a chest that stands out solid and muscular, and an evenly developed body that will make others look like dwarfs next to you. Mail this coupon TODAY! CHARLES ATLAS, Dept. 112, 115 E. 23rd St., New York, N. Y.

**CHARLES ATLAS, Dept. 112,
115 East 23rd Street, New York, N. Y.**

I want the proof that your system of Dynamic Tension will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength" and full details of your 7-DAY TRIAL OFFER.

Name (Please print or write plainly)
Address
City State



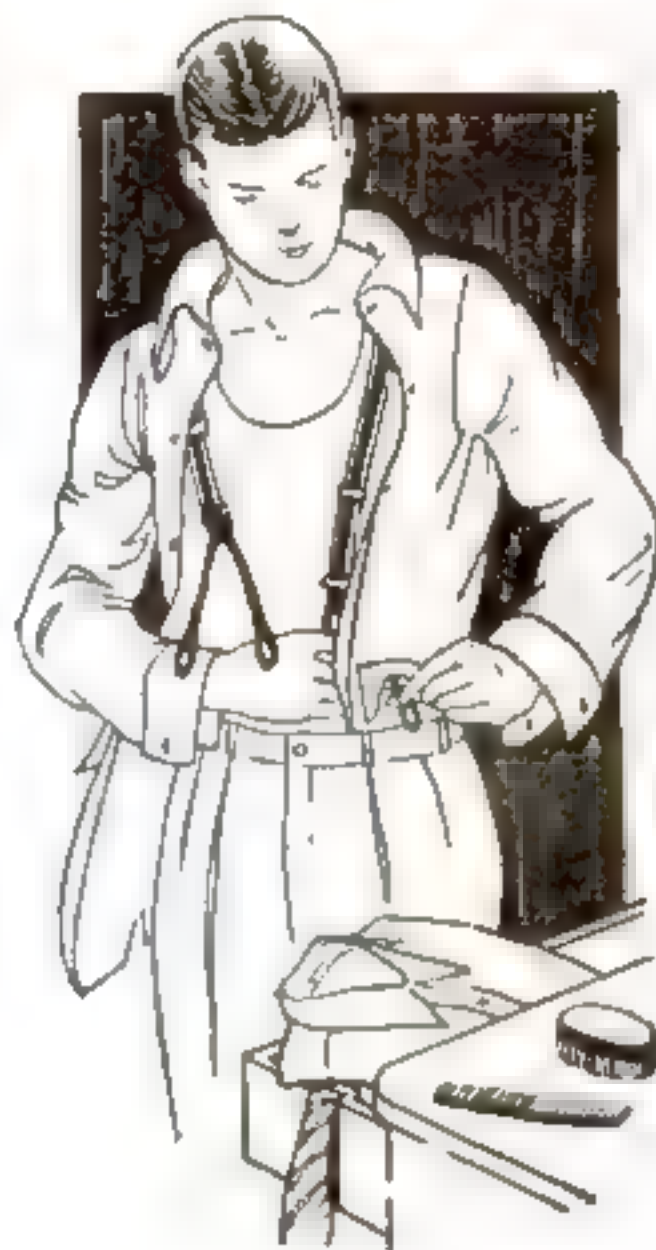
**THIS STERLING
SILVER CUP
BEING
GIVEN AWAY**

This valuable cup stands about 14 inches high on a black mahogany base.

I will award it to my pupil who makes the most improvement in his development within the next three months.

Shirt Covers Suspenders

SUSPENDERS can be kept out of sight when they are worn with a new shirt designed by Moses Liebmann, New York City inventor. Openings in the shirt adjacent to the waistband of the trousers allow the suspender tabs to be pulled through and attached to the waistband buttons in the conventional manner. Flaps of the same material of which the shirt is made extend down over the openings to conceal them, as well as the suspender tabs.



Hand-Held Driving Visor



AN anti-glare device conceived by David Elliott, of Johnstown, Pa., is held in the hand of a motorist to shield him from the direct rays of the sun, or from the beams of approaching headlights at night. Made of a tinted, transparent material, the shield has an elongated opening near its base so that the motorist can grasp it and hold it against the rim of the steering wheel, as shown.

Block Fits Any Size Hat

HATS of any size are easy to clean and block with a new pneumatic device. The invention of George F. Wilhelm, of St. Charles, Mo., the hat block has a hollow body of elastic material which is inflated to a desired hat size by forcing in compressed air through a tube from a storage cylinder.



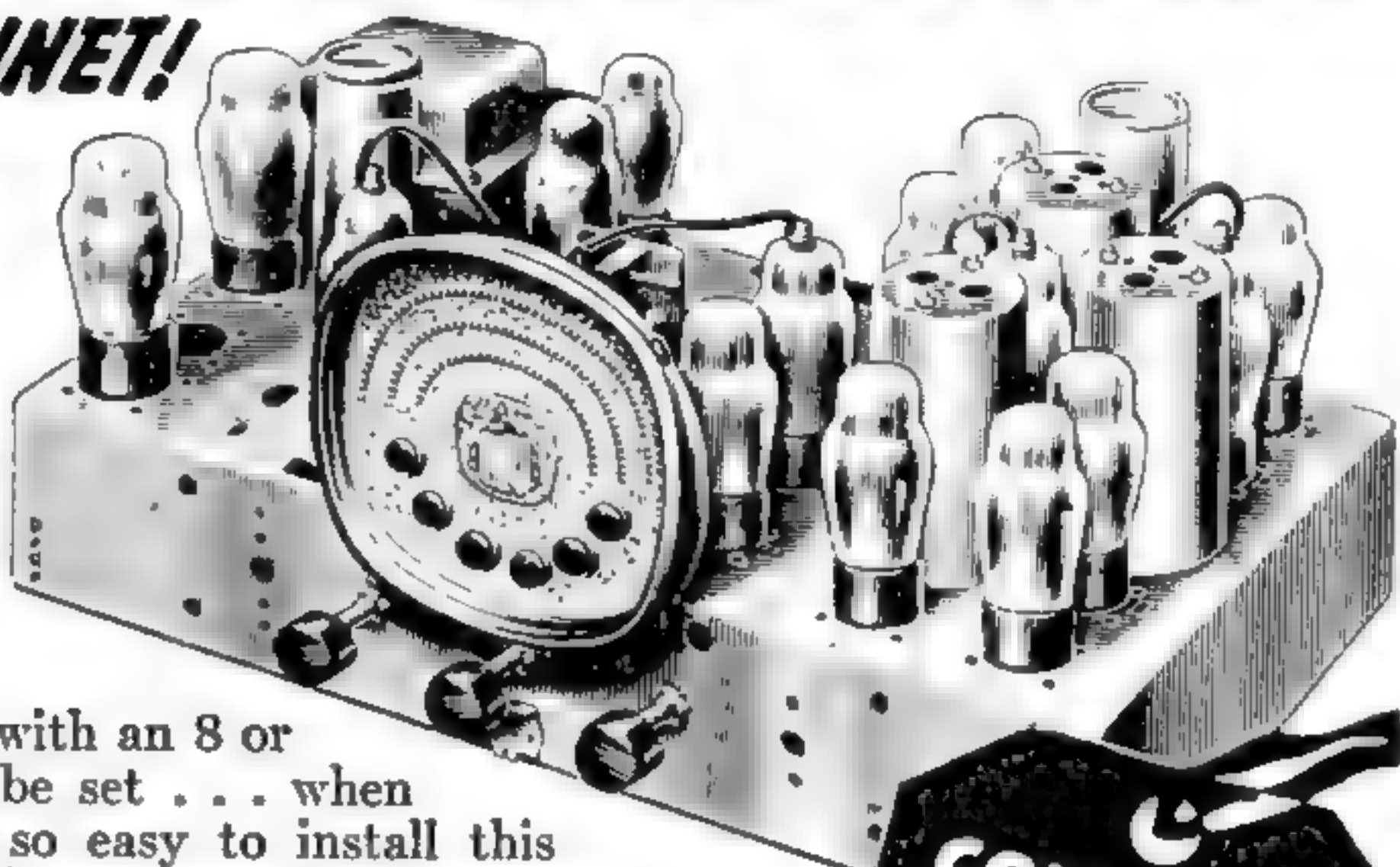
SENSATIONAL MIDWEST FACTORY-TO-YOU SALE

**MODERNIZE YOUR OLD RADIO... PUT THIS NEW CHASSIS
IN YOUR PRESENT CABINET!**

15-TUBE

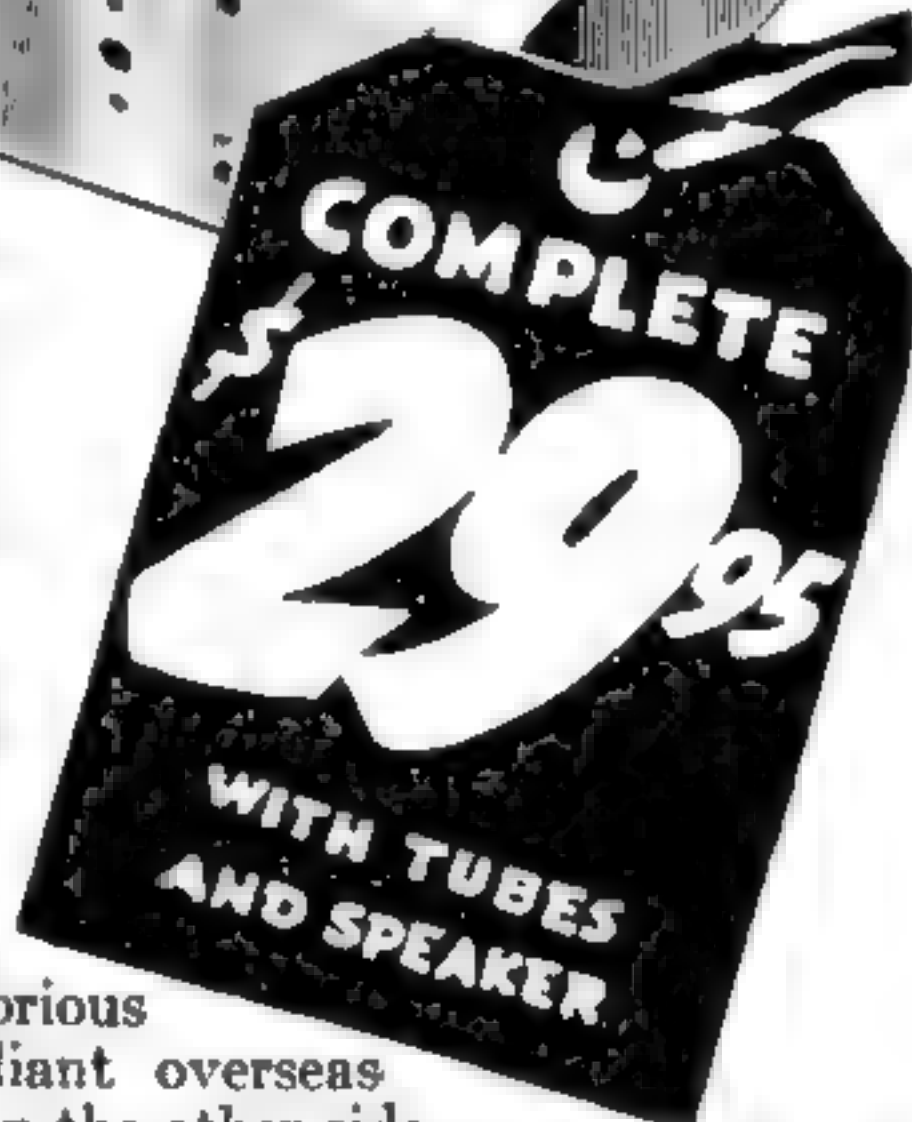
WORLD-WIDE CHASSIS

SAVE UP TO 50%



Once again Midwest scoops the radio world with the year's greatest radio value! Here it is! A big, powerful, 15-tube, world-wide Midwest. At its sensational factory-to-you price of \$29.95, this new 1939 radio is the biggest bargain in Midwest's nineteen years of pioneering! Why be con-

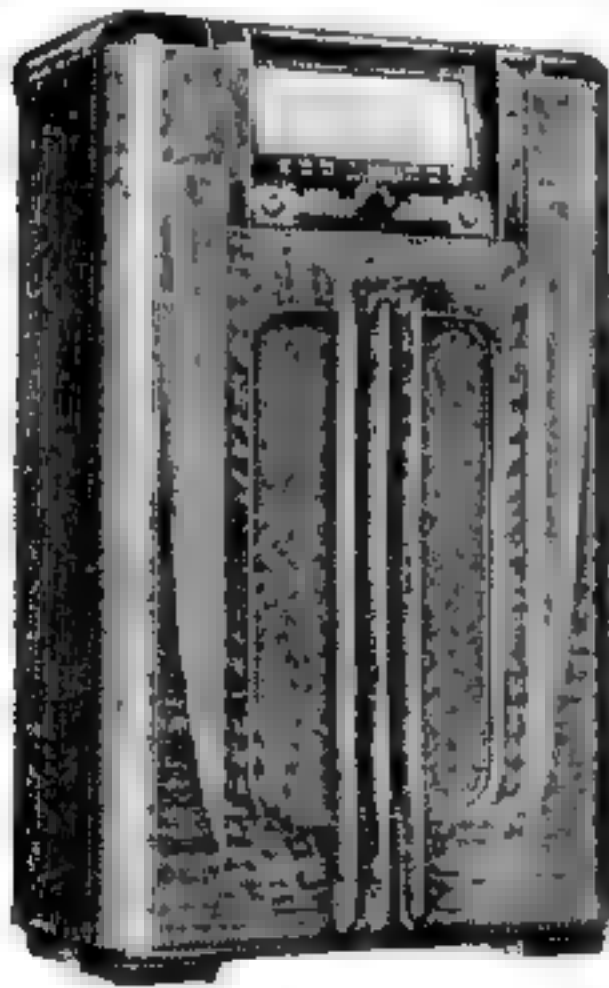
tent with an 8 or 10-tube set . . . when it is so easy to install this new, big, powerful 15-tube chassis (in your present cabinet) for the same price! For a little more than the cost of new tubes, you can modernize your old radio and get exciting world-wide reception.



6-Tube Table Models...To 17-Tube 5-Band Radios

Midwest makes a radio to suit every purse . . . and prices are as low as \$10.95. Send for the new 1939 Midwest catalog and feast your eyes on a complete line of magnificent rare-wood consoles even more beautiful than the new Midwest 17-tube Model "D"

shown at the left. Now, you can delight in 12,000-mile range on 5 bands, glorious new tone and brilliant overseas reception. Stations on the other side of the world come in like "locals." Many thrilling exclusive features.



LIBERAL TRADE-IN ALLOWANCE Up To \$40.00 For Your Old Radio

The famous Midwest 30-day Trial Plan enables you to try any Midwest radio for 30 days *before* you make up your mind. You can trade in your old set and receive as much as \$40.00 trade-in allowance. Tell us the make and age of your present radio—so we can determine how much

to allow you on it. New Easy-Pay Plan makes it easier than ever before to own a Midwest. Absolute satisfaction guaranteed on a money-back basis. Write today for FREE catalog.

**AMAZING
NEW
EASY-PAY
PLAN**

**30 DAYS
FREE
TRIAL**

NOTE

Midwest radios are sold only DIRECT from factory by mail—never through stores or dealers!

**SEND FOR FREE 1939
FACTORY CATALOG**

MIDWEST *Factory-to-You* RADIOS

DEPT. 59-FF, MIDWEST RADIO CORPORATION...CINCINNATI, OHIO, U.S.A.
Manufacturers of Quality Radios Since 1920

PASTE COUPON ON 1¢ POSTCARD... OR

Write Today!

**MIDWEST RADIO
CORPORATION**
Dept. 59-FF Cincinnati, Ohio

Send me your new FREE catalog, complete details of your liberal 30-day FREE Trial Offer, factory-to-you wholesale prices, and big TRADE-IN Offer.

Name.....
(PLEASE PRINT CLEARLY)
Address.....
Town..... State.....
User-Agents Make Easy Extra Money.
Check Here ☐ for details



World's Greatest Collection of Strange & Secret Photographs

NOW you can travel round the world with the most daring adventurers. You can see with your own eyes, the weirdest peoples on earth. You witness the strangest customs of the red, white, brown, black and yellow races. You attend their startling rites, their mysterious practices. They are all assembled for you in these five great volumes of the **SECRET MUSEUM OF MANKIND**.

600 LARGE PAGES

Here is the World's Greatest Collection of Strange and Secret Photographs. Here are Exotic Photos from Europe, Harem Photos from Africa, Torture Photos, Female Photos, Marriage Photos from Asia, Oceania, and America, and hundreds of others. There are almost 600 **LARGE PAGES OF PHOTOGRAPHS**, each page 82 square inches!

1,000 REVEALING PHOTOS

You see actual courtship practiced in every quarter of the world. You see magic and mystery in queer lands where the foot of a white man has rarely trod. You see Oriental modes of marriage and female slavery in China, Japan, India, etc. Through the close-up of the camera you witness the exotic habits of every continent and female customs in America, Europe, etc. You are bewildered by **ONE THOUSAND LARGE PHOTOGRAPHS**, including 130 full-page photos, and thrilled by the hundreds of short stories that describe them.

Contents of 5-Volume Set

- VOLUME 1**
The Secret Album of Africa
- VOLUME 2**
The Secret Album of Europe
- VOLUME 3**
The Secret Album of Asia
- VOLUME 4**
The Secret Album of America
- VOLUME 5**
The Secret Album of Oceania

5 PICTURE-PACKED VOLUMES

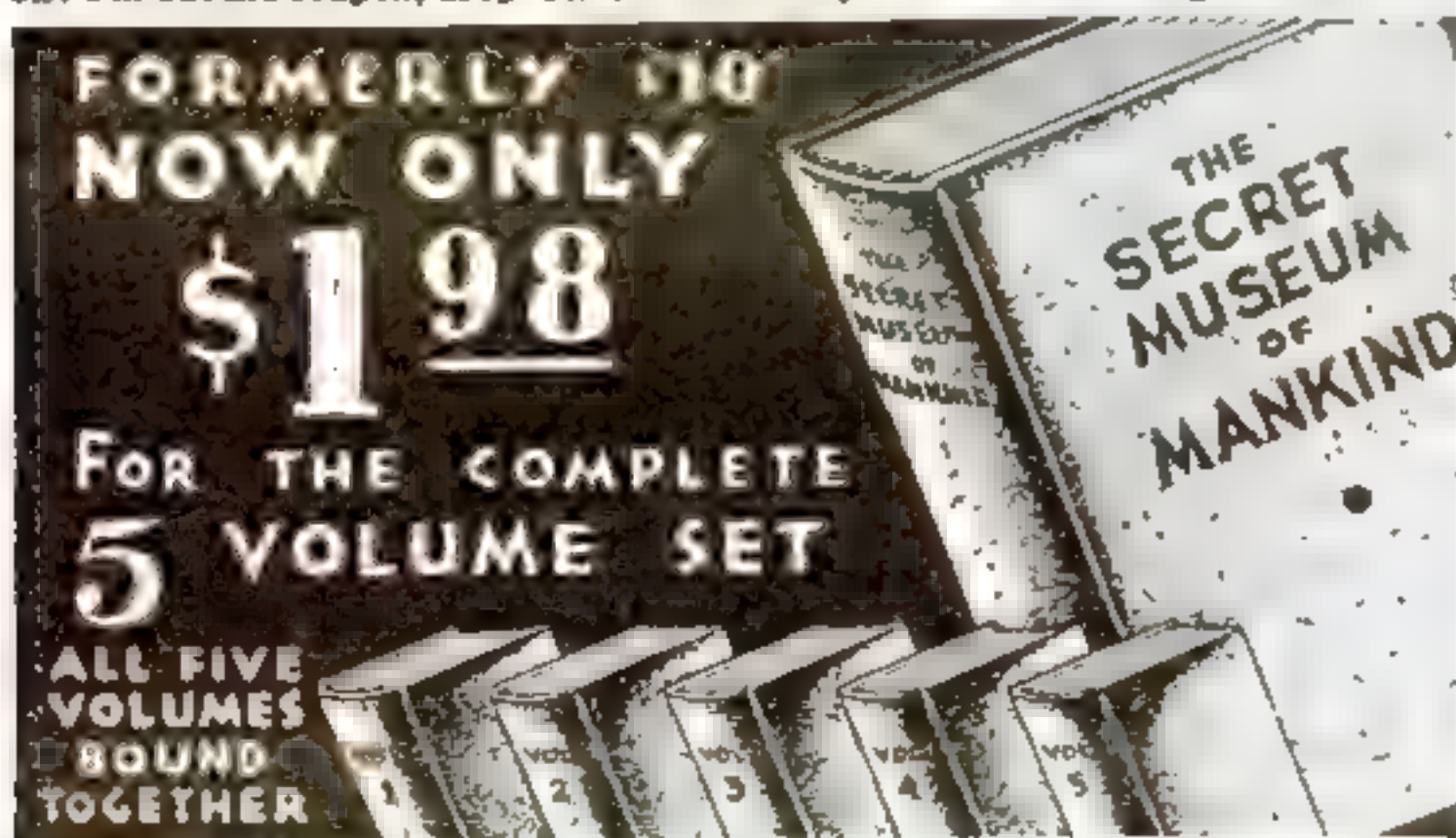
Specimen Photos

Dress & Undress Round the World
Various Secret Societies
Civilized Love vs. Savage
Strange Crimes, Criminals
Flagellation and Slavery
Omens, Totems & Taboos
Mysterious Customs
Female Slave Hunters
1,000 Strange & Secret Photos

The **SECRET MUSEUM OF MANKIND** consists of five picture-packed volumes (solidly bound together for convenient reading). Dip into any one of these volumes, and as you turn its daring pages, you find it difficult to tear yourself away. Here, in story and uncensored photo, is the **WORLD'S GREATEST COLLECTION OF STRANGE AND SECRET PHOTOGRAPHS**, containing everything from Female Beauty Round the World to the most Mysterious Customs and Customs. These hundreds and hundreds of large pages will give you days and nights of thrilling instruction.

SEND NO MONEY

Simply sign & mail the coupon. Remember, each of the 5 Volumes is 9 1/4 inches high, and, opened, over a foot wide! Remember also that this 5-Volume Set formerly sold for \$10. And it is bound in expensive "life-time" cloth. Don't put this off. Fill out the coupon, drop it in the next mail, and receive this huge work at once.



METRO PUBLICATIONS, 70 5th Ave., Dept. 2212, New York

Send me "The Secret Museum of Mankind" (5 great volumes bound together). I will pay postman \$1.98, plus postage on arrival. If not delighted, I will return book in 5 days for full refund of \$1.98. (No foreign orders accepted at this low price!)

Name _____

Address _____

City _____ State _____

☐ CHECK HERE if you are enclosing \$1.98, thus saving mailing costs. Same Money-Back Guarantee.

MAKE MONEY AT HOME

RUBBER MOLDS

Low as 6¢ EA.

Amazing rubber mold-making outfit makes perfect flexible molds of plaques, ash trays, book-ends, etc. Molds cost from 6¢ to 25¢ each. Each mold makes hundreds of novelties and gifts to sell up to \$1.00 apiece! No experience necessary. Quick and easy. Start profitable business in your home... sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. "Molders Handy Book" and list of buyers FREE. Write

SO-LO WORKS
Dept. M-823 Cincinnati, Ohio



TRAIN FOR Radio IN 12 WEEKS

BY SHOP WORK
I'll Finance Your Training
Prepare for jobs in Broadcasting, Talking Pictures, Television, Wireless, etc., by 12 weeks practical shop training in Coyne Shops. Free Employment Service. Many earn while learning. You don't need previous experience or a lot of book learning. Write for **BIG FREE RADIO and TELEVISION BOOK**, and my "Pay-Tuition-After-Graduation" Plan.
H. C. LEWIS, Pres., RADIO DIV., Coyne Electrical School
500 S. Paulina Street Dept. 98-4H Chicago, Illinois

ENCYCLOPEDIA \$1.79!

In **ONE Volume** Formerly in 4 Vols. for \$15.50
Famous **FACTS** Encyclopedia, revised 1938 edition. 1292 pages, 30,000 subjects, 3200 illustrations, 8 1/4 x 5 1/2 x 2 ins., green buckram stamped in gilt and black. "The work I shall now chiefly turn to" says Prof. John Erskine, Columbia U. Examine 5 days **FREE**, then send \$1.79 or return book. Write today.
NELSON DOUBLEDAY, INC., Dept. 12 PSM, Garden City, N.Y.

BARGAINS!!! Used Home-Study Books BOUGHT-SOLD-RENTED

FREE ILLUSTRATED CATALOG tells all about this amazing service. Educational books on all subjects. We buy for cash—we offer sensational bargains, 100% satisfaction guaranteed on every transaction. Send postcard today for full details and big **FREE** catalog. No obligation.

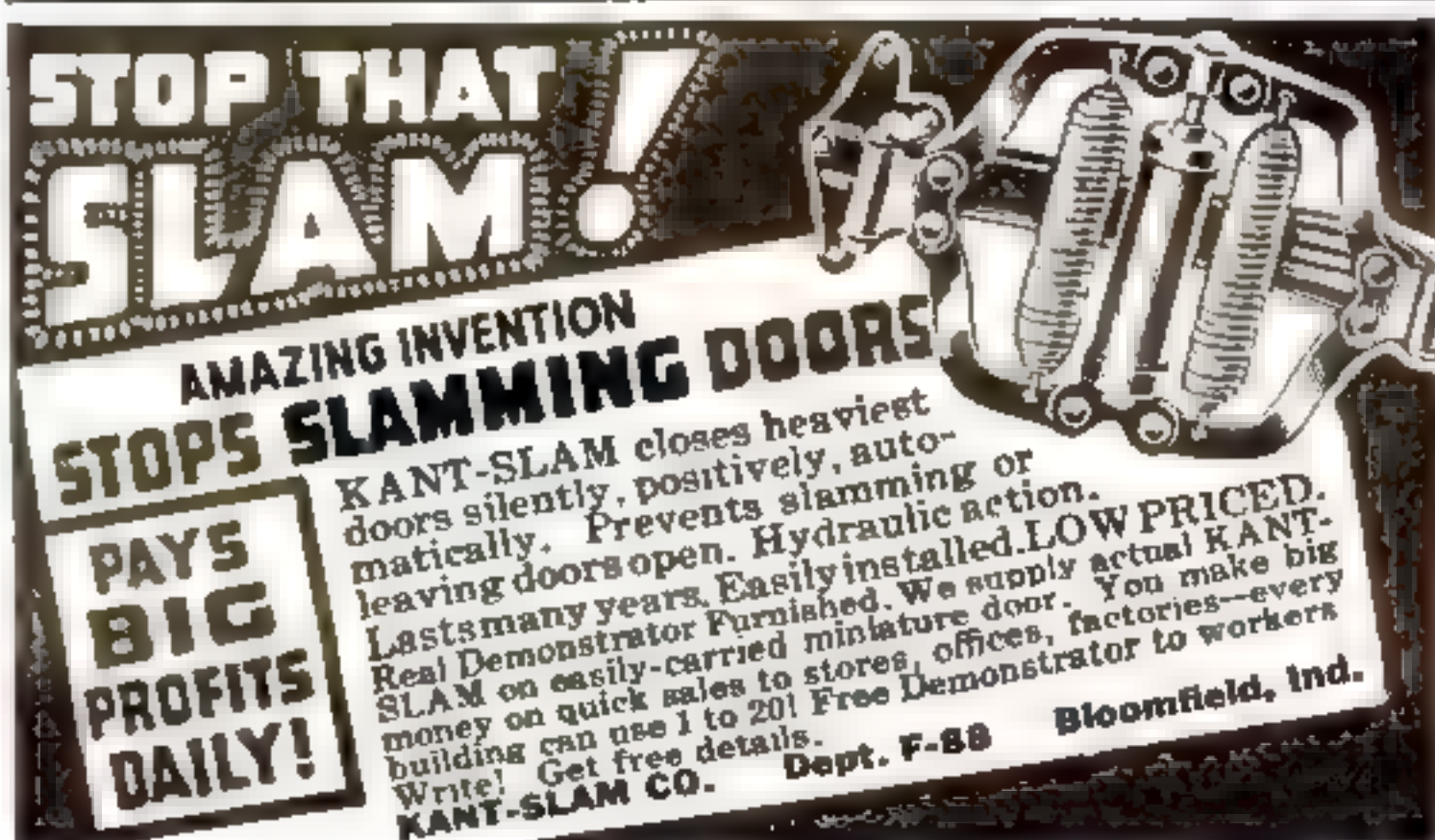
NELSON-HALL CO. 780 Manhattan Bldg., Chicago.

Learn Profitable Profession in 90 days at Home

Salaries of Men and Women in the fascinating profession of Swedish Massage run as high as \$40 to \$50 per week but many prefer to open their own offices. Large incomes from Doctors' hospitals, sanitariums and private patients come to those who qualify through our training. Reducing weight offers real rewards for specialists. Write for Anatomy Charts and booklet—They're **FREE**.

The College of Swedish Massage
1601 Warren Blvd., Dept. 970, Chicago
(Successor to National College of Massage)

Give Books for Christmas! Be sure to see the Special Announcement on pages 260 and 261.



AMAZING INVENTION STOPS SLAMMING DOORS

PAYS BIG PROFITS DAILY!
KANT-SLAM closes heaviest doors silently, positively, automatically. Prevents slamming or leaving doors open. Hydraulic action. Lasts many years. Easily installed. **LOW PRICED.** Real Demonstrator Furnished. We supply actual KANT-SLAM on easily-carried miniature door. You make big money on quick sales to stores, offices, factories—every building can use 1 to 20! Free Demonstrator to workers. Write! Get free details.
KANT-SLAM CO. Dept. F-88 Bloomfield, Ind.

Easy



NEW

Improved CONNQUEROR

World's largest manufacturer announces sensational improvement in Band Instruments. New patented VO-CABELL revolutionizes tone effects. Easier to play. You'll develop talent fast with these new Conns. Choice of world's greatest artists. See your dealer or write today for **FREE BOOK** and home trial, easy payment offer. Mention instrument.

C. G. CONN, LTD. 1232 CONN BUILDING ELKHART, INDIANA

WRITE FOR FREE BOOK

CONN
BAND INSTRUMENTS

Free • DRAFTING

More good jobs now in Drafting. Learn AT HOME in spare time (or at our Chicago School). Send post card for **FREE TRIAL LESSON** and see how easy to learn and get a good job.

CHICAGO TECHNICAL COLLEGE
S-215 Tech. Bldg., 118 E. 26th St., Chicago, Ill.

STUDY ENGINEERING AT HOME

Home Study Courses leading to Degrees in Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering, Arts, Sciences, Philosophy, Education, Public Health, Psychology, Sociology, Physics, Chemistry, Geology, Pol. Science, Theology, Law, Agriculture, Business Training, Accounting, Statistics, Adv. Sales, McKinley-Roosevelt Graduate Colleges, 4204 Clarendon Avenue, Chicago



LIBRARY LIBRARY LIBRARY LIBRARY LIBRARY LIBRARY LIBRARY LIBRARY
PRACTICAL PRACTICAL PRACTICAL PRACTICAL PRACTICAL PRACTICAL PRACTICAL
ELECTRICITY ELECTRICITY ELECTRICITY ELECTRICITY ELECTRICITY ELECTRICITY ELECTRICITY

Know Electricity as Experts Know It—and Get an Expert's Pay!

Recovery has begun! The months ahead are charged with significance and expectation. What will you do to get the jump on the other fellow? Thousands of men have used

The Croft Library of Practical Electricity

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 50,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' Free Examination. We take all the risk—you assume no obligation. If you decide to keep the books, send \$1.50 in 10 days and the balance at the rate of \$2.00 a month. Send the coupon NOW and see the books for yourself.

FREE EXAMINATION COUPON

McGraw-Hill Book Co., 330 W. 42nd St., New York
Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the price of \$19.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name
Home Address
City and State
Position
Name of Company PSM-12-38

GOOD PAY! STEADY JOBS!



Riding gain in control room of broadcasting station

MIDLAND for Training .. RADIO for steady, well-paid JOBS

Here you have the success secret of ambitious young men employed at good pay in many parts of the United States. Trained radio men are needed today and always will be. And now you can get the sound, practical extension training necessary to qualify you for employment in broadcasting, police and aviation radio and many other branches of the gigantic radio industry. **DON'T LET THESE OPPORTUNITIES PASS YOU BY.**



JOHN BASS, Midland trained, employed by Missouri State Hwy. Patrol



EDMOND HATLEY, Midland trained, employed by Braniff Airways, Inc.



JACK COPELAND, Midland trained, employed by TWA

TELEVISION

that amazing new scientific development already perfected to an astonishing degree promises to create employment for thousands in the future. Midland includes thorough, "ultra-modern" television training that can fully qualify you for this wonderful new field.

Take Your First Real Step Towards Success Right Now! Get the facts about Midland Color-Coded training that includes attractive texts, easy-to-understand home laboratory manuals, all equipment and tools to conduct 108 fascinating experiments in your own home, followed by four weeks training in our fine radio-television laboratories where you will have the friendly, expert supervision of real engineers. We even send you a bus ticket to Kansas City for resident training. And when you graduate you will get genuine employment service for life.

Midland Radio-Television Training may be secured on two plans: 1. Combination Extension Resident. 2. Straight Resident.

MIDLAND TELEVISION, INC.

28, 29, 30, 31st Floors Power and Light Bldg. KANSAS CITY, MO.

Affiliated with KMBC—a Major Network Outlet

FREE! SEND AT ONCE FOR THIS BIG ILLUSTRATED BOOK AND A GENUINE, NOTARIZED REPRODUCTION OF A MIDLAND 441-Line "ELECTRONIC" TELEVISION PICTURE.



MAIL COUPON FOR FREE BOOK

Midland Television, Inc., Power & Light Bldg. Dept. 204-M, Kansas City, Missouri

(Paste on penny postcard or mail in envelope)

Without obligating me, send your **FREE** illustrated book on Radio-Television opportunities.

Name Age

Address

City State

Please mention **POPULAR SCIENCE** when writing to advertisers.

HOW SAFE IS



YOUR JOB?

CAN YOU CLASS YOURSELF AMONG THE "OK-MUST KEEP!" EMPLOYEES?

NO USE dodging facts!

At times—in every company's history—the pay-roll goes onto the operating table for major surgery.

And when such times come, certain employees are amputated—sometimes a few, sometimes many.

Yet a certain few are always marked "OK-Must Keep!" And the many who are let out envy them—call them "lucky."

What's Behind Job-Holding "Luck"?

It can be *proved*, however, that there's almost always something more than luck involved.

Even the fellow who seems to "have a drag" may actually have a lot more on the ball than is apparent to his fellow workers.

He may have hidden values that only his superiors see or know about.

After all, the "I-Gotta-Drag-Club" has taken a bad licking. In fact, it rather completely disbanded in 1932-1933.

Yet why is it that some employees hold their jobs at the very time when others of seemingly *equal* ability lose theirs?

If it's not luck, there *must* be some explanation. And there is one!

How to Insure Your Job

The secret of holding your job in hard times is to be invaluable to your employer. And a man or woman who is invaluable is usually a well-trained one.

Training is of many kinds—stems from many sources. But the LaSalle kind has been unusually successful. Nearly a million members, in a score of subjects, over a thirty year period can testify to that—and many can prove it by their pay envelopes!

They have cause to agree with us that the real secret of both promotion and job security is just this: "On your present job, make sure you are doing it well, then *train* for the job ahead!"

Why It Works

Put yourself at your own president's desk for a moment.

You are faced with cutting the pay-roll. First of all, you certainly are going to do your best to hold on to those employees who really know their present jobs.

But among them—the very last to go will be those

LASALLE EXTENSION UNIVERSITY

A CORRESPONDENCE INSTITUTION

Dept. 1283-R CHICAGO

I'd like to know what you can do to help me better my job. Send me your free booklet and full details about the training I have checked below:

☐ Higher Accountancy
☐ Law: LL.B. Degree

☐ Traffic Management
☐ Executive Management

☐ Modern Salesmanship
☐ Industrial Management

Name.....Age.....

Address.....Present Position.....

few who are also wholly or partly trained for the job ahead—even for the job *ahead* of the job ahead!

What You Should Do About It—

But true as these facts are, you probably will tend to do nothing about them.

"My job is safe," you think. "My company won't cut down—and even if it does, I won't suffer."

But doesn't the very fact that you have read this far indicate that there's some small doubt—a trifle of uneasiness in your mind?

Wouldn't you be more comfortable if right now *your* boss knew that *you* were taking LaSalle training—a piece of knowledge that upon request we take pains to bring to the personal attention of every LaSalle enrollee's superior?

What you *should* do about it is, therefore, as obvious as the coupon below.

—If You've Got What It Takes!

That coupon, you know, has helped increase the pay envelopes, brighten the lives, and secure the future for many men and women who saw what they *should* do —AND THEN DID IT!

It isn't easy. It will cost you hours of serious study, of leisure with friends, your radio, and the movies. And, even on our very liberal payment plan, it will also cost you some money.

But any worthwhile insurance does cost money. And since this is the nearest thing to job-certainty that we know about—it is *worth* money!

Why not at least investigate? *That* costs not a cent! The coupon will bring a quick response—may help start you on the way toward the future that's *due* you!

Better mail it now—and play safe!

FREE! Any of these booklets — or similar ones on your own field.



Classified Section

SPECIAL LOW RATE—JANUARY ONLY 25c a word per insertion. Smallest Ad 10 words.

For JANUARY INSERTION copy and remittance must be in this office November 3rd.

POPULAR SCIENCE MONTHLY — 353 Fourth Avenue — NEW YORK, N. Y.

ADVERTISING

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 1746, Chicago, Ill.

MAIL-ORDER ad reaching 1,500,000 families throughout United States \$15.40 inch. Newspaper, magazine, ratebook free. Chicago Advertising Agency, 20-PS West Jackson, Chicago.

INCH display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

ADVERTISE: 24 words in 250 newspapers \$10. Lists free. Advertising Bureau, 4515-P Cottage Grove, Chicago.

45 WORDS displayed 25 magazines, \$3.00. Goodall, 628 Montgomery, San Francisco.

AGENTS WANTED

HABERDASHERY Store in your pocket! Huge selection customized shirts, each made in 90 sizes! Complete line of hosiery, ties, underwear, pajamas and winter jackets. Half price offer creates terrific values. Simply display complete self-selling free outfit. Write orders. We deliver and collect. Advance cash commissions; bonuses! Everything guaranteed one year! We pay over \$100,000.00 yearly commissions. Get your share. Postcard brings you outfit prepaid. Rosecliff-Quaker, "Shirtmakers since 1895," 1239 Broadway, Dept. 144, N. Y.

WEAR fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 80-M, Greenfield, Ohio.

100% PROFIT in new perfected (1938) quick-action self-starting cigar lighter. No flint or friction. No wind can blow it out. Retail 25c. Costs you \$1.75 dozen. Sample and can fluid 25c. New Method Co., Box PS-72, Bradford, Penna.

AGENTS wanted. New ladder top safety device just out. \$1.50 brings agents sample postpaid. Rush for protected territory. 100% profit waiting. Write for information. Marrless Safety Rollers, Appleton, Wis.

IF earnings up to \$45 first week will satisfy you, I'll send complete outfit to run home-operated grocery agency. Absolutely no money risk. Details sent free. Write Albert Mills, 6244 Monmouth, Cincinnati, Ohio.

AGENTS wanted. Food salesmen, church and club members—add to your income. Sell Superior Dated Vitamin Tablets. Unusual demand. Controlled laboratory freshness. Certified quality. P. O. Box 4510, Philadelphia, Pa.

LOCAL Agents wanted to wear and demonstrate suits to friends. No canvassers. Up to \$12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. M-221, 500 Throop, Chicago.

BIG Money applying initials on automobiles. Easiest thing today. Free Samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco," 1305 Washington, Boston, Mass.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FB-1142 Sunnyside, Chicago.

IF you are ambitious you can make good money with a Rawleigh Route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box L-2-PSAW, Freeport, Ill.

BIG money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 47, Dunellen, N. J.

AT home, your own manufacturing business, making popular \$1.00 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. K-824, Cincinnati, Ohio.

FREE sample—amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Besco, 5009-X, Irving Park, Chicago.

AMAZING invention. Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Calculator Co., Box 1118, Chicago.

500% PROFIT selling new "20-in-1" kitchen utensil. Retail 25c. Costs you \$1.00 a dozen or \$7.20 a gross. Sample 10c. New Method Co., PSM-72, Bradford, Pa.

500% PROFIT with new perfected (1938) quick-action, no flint, automatic gas lighter. Retail 25c. Sample 10c. New Method Co., Box PSG-72, Bradford, Pa.

AGENTS. Start own business. Home office. No peddling. Little or no investment. Full particulars free. Begley Specialty, 1472 Broadway, New York.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

BUSINESS proposition resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 910, Marion, Ind.

SUCCEED. With your products. Make—Sell them. Formulas. Processes. Accurate Analyses. Catalog Free. P. Thaxly Company, Washington, D. C.

AGENTS: Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214-A Grand St., N. Y.

SOCIAL Security Gold Bronze Plates sells 35c, cost 5c. Engraving Tool \$7.50. Big Money Maker. Machinery Sales, 192 North Clark, Chicago.

BALLGAMES, movies afternoons. Work mornings home, your own business. Introductory Booklet Free. Stamford, 3762-m Broadway, N. Y.

DEFROSTS Windshields without heat. New invention. Fits auto pocket. Defies frost, sleet, ice. Samples sent on trial. Rush name. Kristee, 108, Akron, Ohio.

ELGIN, Waltham watches, \$3.95. Make big profits. Send for free jewelry catalog. Plymouth Jewelry Exchange, 163 Canal St., New York.

NEW Beauty Thrill "Valizon Bubble Bath." Jar 35c. Valtex Products, Rochester, N. Y.

300% PROFIT selling gold leaf letters for store windows; free samples. Metallic Co., 437 North Clark, Chicago.

\$50 WEEKLY calling on stores. No selling. Just deliver—collect. Drexel Sales, Box 97, Drexel Hill, Pa.

"KEENEREDGER" produced 750 smooth shaves from one blade. Sample \$1.00. Keeneredger, Oblong, Ill.

ATLAS window sign letters. Large sizes, penny each. Beautiful free samples. Atlas, 7941-K Halsted, Chicago.

"44 STEPS to Mail Order Success!" 12 pages; definite facts, 50c. Specialty Services, Box 515, Minneapolis.

PIPE smokers: new device, eliminates ash-tray odor, wet heel, plugging, slugs, dime. Hazett, 701 Fourth, Baycity, Mich.

EXCLUSIVE representatives appointed. Faucet water softener. Revolutionary. Luxusoft, Sausalito, Calif.

AFTERNOONS Free! \$300 month—home! No canv. Expect surprise! Folios-B, Station D, Los Angeles.

STOP Job Hunting! Sell "Exolene." Profits to 500%. Auto product needed by millions. Thermo Exolene Works, Peoria, Ill.

MAKE products yourself. Formula Catalog Free! Kemixq, 180-N Parkridge, Ill.

THREE new fast sellers. Vincent, 822 N. 24th, Milwaukee, Wis.

AIR CONDITIONING

AIR-CONDITIONING Outfits; easily built! Home, work-shop, stores, offices! Enjoy "mountain air," year-around health and comfort. Complete instructions. Seven different blueprints. Send \$1.00. Money-back guarantee. Servatex Company, 850-PSM Madison Building, Milwaukee, Wisc.

ANTIQUES, RELICS INDIAN GOODS

12 ARROWHEADS, spearhead, knife \$99. 4,000 bargains. Bannerstones pipes, gem-points, gorgets, blunderbusses, antiques. Beautiful catalogue 10c. Museum, Rutland, Ill.

100 GOOD ancient arrowheads \$3.00; Tomahawk head 50c. Flint knife 25c. Illustrated catalog 5c. H. Daniel, Hot Springs, Ark.

MINERAL specimens and books on mineralogy, gem polishing, fossils, meteorites, etc. Catalog 5c. The Gem Shop, Box F797, Helena, Mont.

LARGEST catalog, fine Indian material ever issued. Bernard, Box 192, Oakland, Calif.

100 GOOD; or 60 fine; arrowheads, \$3.00, postpaid. George Holder, Glenwood, Ark.

AUTHORS' SERVICE

BOOK manuscripts wanted—all subjects—for immediate publication. Booklet free. Meador Publishing Co., 324 Newberry St., Boston, Mass.

WANTED original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers Ltd., Dept. 96W, Toronto, Can.

SHORT stories and novels revised, typewritten, marketed. Details free. Hursh Service, Box S-1013, Harrisburg, Pa.

AUTOMOBILES

MIDGET racing book; facts for fans, builders, drivers; track sizes, regulations; pictures, specifications, working drawings. \$1.00 postpaid; \$1.15 C.O.D. Ray Kuns, Dept. 230, Madisonville, Cincinnati, Ohio.

MIDGET autos! Plans, parts, kits. Catalog-handbook, 10c. Latest lists 100 used motors, midgets, parts, 20c. Details free. Shipps Midgets, Box 543-K, Zanesville, Ohio.

FORD V-8's, 1934-1938; gasoline saving device \$1.00. Walert Co., 3429 N. 10th St., Milwaukee, Wis.

R AND R Mfg. Co., Anderson, Indiana. Racing Cars and Midgets. Cat. 25c.

AUTO SUPPLIES & EQUIPMENT

CONVERT your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 3. Harrington Company, 201-204 Manchester Bldg., Portland, Ore.

NEW accessory serves driver as tires serve vehicle. Doubles motoring pleasures, adds safety. Only \$3.95. Agents wanted. Patentee, 111 North First Avenue, Phoenix, Ariz.

FOG penetrating. Neon spotlight. Send \$1.00 for 28 inch neon tube and complete plans, using Ford Coil. Bohlman, 107-29 Van Wyck Blvd., Jamaica, N. Y.

REFINE used motor oil without cost. Particulars. Gerwin, Fairview Oklahoma.

MIDGET auto building kits, \$20.00 less motor! Shipps Midgets, Zanesville, Ohio.

AVIATION

100 AIRPLANES, \$50.00 up. Terms. Complete catalogue, 25c. Used Aircraft Directory, Athens, Ohio.

GET into aviation. Airline pilots get up to \$700 a month; Mechanics, \$200; aeronautical engineers, \$400. Prepare now at this government approved school. Write for complete information. Lincoln Airplane & Flying School, 2101 Aircraft Bldg., Lincoln, Nebr.

AIRMINDED young men—Train for apprenticeship, mechanic, pilot, meteorologist. Good future. Write, immediately, enclosing stamp. Mechanix Universal Aviation Service, Strathmoor Station, Dept. H2, Detroit, Mich.

GET into aviation by the Transport License Method, which takes the drudgery out of study. For better pilots and better mechanics. Write for circular. Thompson Aviation Publishers, 8312 Woodward Ave., Detroit, Mich.

AVIATION needs men. Pilots, mechanics, draftsmen, sheet metal, positions open. Learn now. Free catalog. California Flyers School of Aviation, Dept. PSC-12, Los Angeles Airport, Inglewood, Calif.

AIRPLANE mechanic's license questions with answers, diagrams, \$1.25. Engine Mechanic's, \$1.25. Both postpaid; \$2.00 remittance. Meyer Engineering, Box 8D, Hempstead, N. Y.

AEROSLED Motors, 80 horsepower, air-cooled, new, weight 285, overhead valves. Price \$75. Propellers \$10.00. Allison Aircraft, Lawrence, Kansas.

NAVY Aviator Helmets, Calif Leather, chamois lined, fur interlined, very warm, large sizes, only \$2.95. Air Transport, Garden City, N. Y.

PROPELLERS for airplanes, sleds. Also icesled blueprints. Catalog dime. Lorenzen Propeller Company, Niles, Mich.

MODEL airplanes, boats, radios, supplies. Catalog 3c. Imperial, 416-J McDonald, Brooklyn, N. Y.

PROPELLERS for Sleds, Aircraft, Catalog 5c. Banks Propellers, Love Field, Dallas, Texas.

BATTERIES, GENERATORS, ETC.

EDISON storage batteries for lighting and power. Non-acid. Odorless. Fifteen year life. Five year unconditional guarantee. Reasonably priced. Tremendous savings in battery and light plant combinations. Free illustrated literature. See-Jay Co., 87 Sterling Ave., Yonkers, N. Y.

ELECTRICAL Arc Experimental Kit! Make powerful searchlight; melt glass, copper, iron; generate suntan rays, dozen others. Complete with power reducer, goggles, carbons, instructions. 110-volt. Postpaid \$1.99. Electrical Salvage Co., Box 524-SIC, Lincoln, Nebr.

EDISON lifetime storage batteries for light and power. Eliminate acid battery diseases. Long guarantee. All kinds rebuilt generating plants, motors, and miscellaneous articles at bargain prices. Free interesting literature. W. Hawley Smith Company, Croton Falls, N. Y.

PLATING generators and motor generator sets. Write for information. Hobart's new line electro plating equipment. Payments low as \$12.40 monthly. Quality machines, quick delivery guaranteed. Hobart Bros., Box P-1281, Troy, Ohio.

RE-BUILD Old Auto, Farm Light Batteries. Send 25c for Complete Course and catalog. Tools, molds, etc. Home Occupations, St. Paul, Minn.

BUILD slow wind generators. Model T. No rewinding. Instructions. 50c. Complete. B. Brumelle, 199 East Pike, Zanesville, Ohio.

PRACTICAL changes for automobile generators. See our advertisement at bottom of page 263. Autopower.

BLUEPRINTS & PLANS

FIFTY cents brings you a book containing complete instructions, diagrams and specifications for building fireplaces at less than half cost. Fireside Company, Albany, Ore.

BOAT blueprints. Many designs. Catalogue 10c. Cleveland Boat Blueprint Company, Station A-7, Cleveland, Ohio.

BOATS, OUTBOARD MOTORS, ETC.

SHIP model construction sets, blueprints. Largest and finest selection of separate fittings. Leading manufacturer of model racing yacht fittings and sails. Send 20c (coin) for illustrated catalog. A. J. Fisher, 1002-S Etowah Ave., Royal Oak, Mich.

KAYAKS, kits, blueprints. Illustrated catalogue 10c. Viking Kanoe Co., Merrick, N. Y.

BUILD your favorite boat, save on the cost. The Welch System of Boat Building makes this possible. Send 10c for 32 page catalog showing Welch Designs, White Cap Motors, Boat Equipment. The Welch System completely explained in this interesting book. Use Welch Ready Cut parts and Build your Boat at home. Welch Boat Company, Station K-9, Milwaukee, Wis.

BOAT blueprints and full size paper patterns, priced 50c up. Wide selection. Cruisers, runabouts, sloop, snipe, outboard boats, etc. Designed by leading naval architect. Rush 10c for illustrated catalog. Cleveland Boat Blueprint Co., Station A-3, Cleveland, Ohio.

COMPLETE your own boat with our prefabricated frames and materials. They're different. Save 2/3s and costly mistakes. Send requirements for quotations. Illustrated catalog 100 boats, 10c. Bay City Boats, Inc., Bay City, Mich., 1554 Adams St.

BOATS, build them yourself, our full-sized paper patterns make it easy. Send 10c for catalog. Melrose Boat Works, Magnolia Springs, Ala.

OUTBOARD motors. Used parts. All makes. Outboard Headquarters, 305 Atlantic Ave., Boston, Mass.

BODY-BUILDING COURSES

EXERCISE equipment, courses. Special offers! Free booklet. Good Barbell Co., Dept. 6, 947 Elm, Reading, Pa.

BOOKS, PERIODICALS, ETC.

POSTCARDS. Folders. Novelties. Comic Christmas, New Years, lovers, flappers, boozers, fish jokes, New York City assorted views, 200 for \$1.00. Fan dancers, comic mirrors, naughty pigs, fun cards, photos, 20 samples, catalog 10c, stamps. A complete assortment, over 100 samples, \$1.00. Express prepaid. Artform Company, 1710 Undercliff Ave., New York City.

"HITLER and the So-Called Jew." Most startling revelation in pamphlet form, 25c. Griffith, 53 East 130th, New York City.

SPARE-TIME subscription representatives for all magazines. Instructions, complete starting supplies; free! Pinesa, 583 Monroe, Brooklyn, N. Y.

FREE catalog scientific, mechanical and technical books. Readers Service, 800-16 North Clark, Chicago.

ONE dollar brings you an illustrated book on the care and training of dogs. B. Simon, 1953-65 St. Brooklyn, N. Y.

BUILD IT YOURSELF

FURNACE Regulator, automatic for hot air or steam. Complete plans including bimetal for thermostat \$1.00. Dennis Plans, Dept. 12B-2807 Ewald Circle, Detroit, Mich.

BUILD power Scooters, Midget Cars. We supply tires, wheels, motors. Lowest prices. Send 10c for plans, etc. Build-Your Own Devices, 5240 Lake, Chicago.

BUSINESS OPPORTUNITIES

PLASTEX Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties and utility products in Plastex and marble imitation. 1/2c material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods. Ambitious men have chance for real prosperity. Plastex Industries, Dept. S., 1085 Washington Ave., New York, N. Y.

HERE'S a real opportunity. If you want a business of your own that is substantial money maker right now and has unlimited future, and if you have \$500 cash to operate a business in an industry which Roger Babson predicts will, in ten years, be larger than automobile industry is today, write Department 21, Box 187, Lafayette, Ind., for complete details.

ARTIFICIAL marble sanitary flooring, instruction covering wood or cement flooring 1/2 inch thick, fireproof all colors; low cost, ornamental casting, concrete, plaster, papier-mache garden furniture, statuary, flexible molds, particulars free. C. Mahler, Elmont, N. Y.

WE help start you in business, furnishing outfits and instruction, operating "Specialty Candy Factory" home. Men and women, opportunity to earn \$20 to \$50 weekly, all or spare time. (Our 29th year). Booklet free. W. Hillyer Ragsdale, Inc., Drawer 14, East Orange, N. J.

MAKE Money at Home! Grow Mushrooms in cellar or shed, with Ami U. S. Patented Mushroom Spawn and step by step, easy to follow Manual of Instructions. Fascinating, profitable. Booklet free, write today. Anglo American Mushroom Industries, Dept. 26, Toronto, Ont.

FREE. Big 32-page book explaining composition novelty manufacture! Tells you how to make extra money in your spare time! Supply limited! Write today! Stewart's Studio, Dept. S-9, 2927 Wilcox, Chicago.

COLOR concrete surface with chemical solutions. Beautiful pottery without moulds. Garden wishing-wells. Stucco rock. Glazing concrete. Sample 10c. Hollywood Cement Craft, 8530 Wonderland, Hollywood, Calif.

MAKE artificial marble, glazed tiles, uncanny. Tablesops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John J. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

HYDROPONICS: Grow plants and flowers without soil. Chemical crop culture. Interesting, educational. Unusual yields. Formulas, instructions and selected bibliography. \$1. Hydroponics, Box 613, Guthrie, Ky.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads, Gibson Laboratory, Chemists, FC-1142 Sunnyside, Chicago.

LEARN arc welding—A growing industry with great opportunities. Consult your local school, or if there is none available write The Lincoln School of Welding, Dept. B, Box 5758, Cleveland, Ohio.

If you are ambitious you can make good money with a Rawleigh Route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box L-2-P.S.BO, Freeport, Ill.

FASCINATING Profitable Home Business. We show you how to make Vanilla, Auto Polish, Anti-Freeze, Laundry Bleach, etc. 25c brings simplified instructions. Home Occupations, St. Paul, Minn.

DO You Want More Money? "Think and Grow Rich." Teaches the Thirteen Steps to Riches. Quick and Easy to Learn. \$2.00 Prepaid anywhere USA. LaBahn, 603 Main, Evanston, Ill.

IMPORTING! Wholesale supply directory of foreign manufacturers and exporters. Over five million items, 10c postpaid. Bison Service, D-PS, Buffalo, Minn.

If you have some spare room where you can do light work, see our offer on page 43. Metal Cast Products Co., 1696 Boston Road, New York City.

107 WAYS to make money, in home or office, business of your own. Full particulars free. Elite Co., 214-A Grand St., New York.

SUCCEED. With your products. Make—Sell them. Formulas. Processes. Accurate Analyses. Catalog Free. P. Thaxly Company, Washington, D. C.

"500 ADVERTISING Ideas." Book of the hour! Exposes all! Pulls cash, orders, prosperity, \$3.00 value; now 25c postpaid. McArthur, Drawer 339-6, Butte, Montana.

"THE Key to Business Opportunities." Can be worked three ways. Particulars for stamp. Maples, 3418 South Marshfield, Chicago, Ill.

FOR an extremely profitable lifetime business, operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

MONEY made quickly, honestly. No canvassing. "Business opportunity" circulars free on request. Board's Distributing Center, 1912-14th St., Washington, D. C.

CAPITALIZE on your ideas. Send self-addressed stamped envelope for information. Allison-Items, Box 81, Bound Brook, N. J.

"BINGO," new coin operated amusement game. Large income, operating "route." Small investment. Details free. Robbins, 1143 DeKalb Ave., Brooklyn, N. Y.

SIGNS and Showcards easily painted with Letter Patterns. All sizes. Booklet and sample mailed for 3c stamp. John Rahn, G1330 Central Ave., Chicago.

HUNDREDS of money making opportunities, plans, ideas. TechSerCo, 6-b4 Ashland, Boston, Mass.

SELL by mail! Books, novelties! Bargains! Big profits. Particulars free. C. Elfco, 438, North Wells, Chicago.

205 **MONEYMAKING** Plans; opportunities to make up to \$75.00 weekly, today's conditions. Introductory Booklet Free. Stamford, 3762-n Broadway, N. Y.

6 **MAIL** order magazines, including all you must know about mail order business, 15c. Armand Cartier, 31 Cumberland St., Woonsocket, R. I.

BELTS; men's, women's; make 'em and make money. Ideal Christmas gifts. We supply materials. Sample 25c. Art Leather, 400 Joseph Ave., Rochester, N. Y.

SCORES of big paying mail order and Home Work earning opportunities available. Kessler, Box 311-SB, East St. Louis, Ill.

WANT a raise? Laid off? Read "Human Efficiency." Efficient workers hold jobs. Write for circular or send \$1.00. Shertzer, 970 Weber, Pomona, Calif.

MEXICAN leather pictures. Christmas novelty, 50c (stamps) bring \$2.00 worth samples, details. Refunded if unsatisfied. Mexicanart-P, Apartado 1593, Mexico City.

MODERN industries, 24 pages, 8x11; money making schemes, ideas, opportunities. Something different. Dime. Ferris, Box 767, Bremerton, Wash., Dept. 2K.

WHERE to buy at lowest wholesale prices. Information free. Yorena, Box M-312, Bayonne, N. J.

LIKE to draw? Earn steady income tracing and duplicating cartoons for advertisers. Adservice, Argyle, Wis.

START you in business. Popcorn machines, potato chip machines. Long Eakins, 2046 High St., Springfield, Ohio.

FREE only successful process refining old lube for market. Send stamp. Boisset, 525 Howard Ave., New Orleans, La.

MAKE Costless Cylinder Oil Reclaimer. Save hundreds. Instructions 50c. Thermo S-Lab, Peoria, Ill.

HANDY men. Earn money home operating Community "Fix-It" shop. Stafford, Makanda, Ill.

HOW and where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

MAKE your own rubber molds. Sample and details free. June, 101-A Beech, Holyoke, Mass.

COUNTRY Drives or movies afternoons! Work mornings home. No canvassing! Folios, Station D, Los Angeles.

ADDED income ideas. Mail Sales News Magazine, copy 10c. Katz, 4254 No. Kimball, Chicago.

NEW money-makers! \$10.00-\$20.00 daily! Details free. Samples 10c. Marquez-IBB, Apartado 1176, Mexico City.

CAMERAS, PHOTO SUPPLIES

BASS: at the Camera Cross Roads of the world has just issued a new and sensational Bargaingram No. 235 listing outstanding values in cameras and accessories. Here are a few typical items: Bass's own DePranne Sport, 16 or 8 shots on 120 roll film with F:3.8 lens. Prontor II shutter, velvet lined case, \$29.75; Dollina II, Range-finder coupled Radionar F:2.9 lens, Compur Rapid shutter, \$49.75; Super Press Bee Bee 6 1/2 x 9 cm. film pack and plate with F:2.9 lens, \$59.75; and dozens of other superb values. Order from above or get Bass' free Bargaingram. Write Dept. SP, Bass Camera Co., 179 W. Madison St., Chicago, Ill.

CAMERAS and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses, at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book; just out! Limited edition. Hurry! Central Camera Co., (Photographic Headquarters since 1899), 230 South Wabash, Dept. 12-S, Chicago.

WHAT would you do with \$150.00? That's one of the cash prizes you may win in this month's Minicam "Water Picture" contest. Write for free folder giving you all details. Or send 25c for sample copy of this sensational, packed-with-dynamite 108-page miniature camera magazine. Special: You also secure free 8-page brochure entitled "How to Make Every Shot A Prize Shot." Write: Minicam Magazine, 8 E. 12th St., Cincinnati, Ohio.

300 PHOTO-KINKS, 25c. Covers enlarging, lens care, developing printing, focusing, effects, coloring photos, etc. 64 page Adservice, 800-47 N. Clark,

IF you go to Mexico, ask first for prices and pamphlets of finest German quality miniature and other cameras, binoculars, movie cameras and projectors. Foto Mantel Sucr. R. Rudiger, V. Carranza 11, P. O. Box 1459, Mexico City-111. Branch store: Tijuana, Lower California, Hotel Commercial. Branch Store: Monterrey, N. L., Morelos Oriente No. 557.

NO more wasted film or unnecessary expense. Take pictures you can be proud of. Sell to magazines and newspapers. Make good money wherever you live. Easy, low-cost home study course shows you how! Free catalog. Universal Photographers, Dept. T, 10 W. 33 St., New York City.

MAKE money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 1742, Chicago, Ill.

DU-PONT Superior panchromatic; Eastman Sup-X, guaranteed 35mm, packed, 25' roll, \$1.00. Agfa ultraspeed \$1.50. Du-Pont visual panchromatic filter, essential to perfect photography; just out, \$1.50. Optical Development Corp., 1560 Broadway, New York.

CHRISTMAS Special: New Curt Bentzin Primar, roll film, double size Camera, 2 1/4 x 3 1/4 and 1 5/8 x 2 1/4. Trioplan F4.5 Anastigmat lens, compur self-timing shutter, \$24.50. New York Camera Exchange, 109 Fulton St., N. Y.

THREE filters for \$1.00. Yellow, red, and green with hard fiber frames and adjustable springs for lenses up to 1 1/4 inches in diameter. Kay Photo Supplies, Box 51, Cicero, Ill.

MAKE money selling snapshots. Dime brings 100-page book, complete instructions, buyers, real information. Lyons-Publishers, 402-R Evans Bldg., Washington, D. C.

6 1/2 x 8 1/2 **VIEW** Camera. Darlot Lens, plate holders, case, \$16.50. Send stamp for complete list. H. R. Johnson, Box 206, Baltimore, Ohio.

SEND for new Photographic "Bargaingram" before buying elsewhere. 1,500 live specials. Mogull's, 66 West 48th, New York.

20% TO 40% discount on films, paper, still or movie cameras. Write: Paramount Co., 327-PS, East 92nd St., New York.

8mm, 16mm **FILMS**, equipment bargains. Sale, rental. Send stamp for lists. Abbe Films, 1265 Broadway, N. Y. C.

FREE instructions. Make powerful telescope. Jamer, 94R, Manorville, N. Y.

CAPITAL

WE show you how to raise capital for your business. Write Enterprise Bureau, Syracuse, N. Y.

CARTOONING, SIGN PAINTING, SHOWCARD WRITING

CARTOONING for profit. Illustrated. Contains cartoon markets, selling plans, syndication, drawing for reproduction, preparing cartoons for publication, tricks and short cuts of the trade. \$1.00 postpaid. Smith's Service, Wenatchee, Wash.

SIGN your name in embossed gold on birthday cards, season's greeting cards, anniversary cards, etc. For complete Rotex embossing ink outfit send 25c to United Chemical Laboratories, P. O. Station U, Box 2, New York.

CARTOONING, sketching, etc. 46 lessons. 600 illustrations, including drawing paper, pens, pencils, \$1.00 complete. Fraba Service, Poplar Bluff, Missouri.

LIKE to draw? Earn steady income tracing and duplicating cartoons for advertisers. Adservice, Argyle, Wisc.

GAGWRITER will furnish original ideas for cartoons. Paul Green, Winnsboro, Texas.

CHALK TALK STUNTS

LAUGH producing program. \$1.00. Illustrated catalog 10c. Cartoonist Balda, Oshkosh, Wisc.

CHARTERS

DELAWARE charters; complete service \$35.00. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Del.

CHEMICALS & APPARATUS

FREE chemistry catalog. Supplies at 5c. Equip complete laboratory. Send 3c for postage. Kemkit Scientific Corporation, 397B Bridge Street, Brooklyn, N. Y.

FREE instructions how to win 1938 award on honor roll of amateur chemists a new catalog listing hundreds of chemicals, chemical novelties, books, etc., with order for one of following: Magic chemical submarine, 10c, large size 25c. Magic chemical forest, 10c, large size 25c. Complete chemical set, 50c. Formula for growing plants chemically without soil, \$1.00. Clinton Chemical Co., Swedesboro, N. J.

HANDBOOK for chemical experiments—hundreds of experiments, illustrated, 5c. Experiment booklet 15c. Chemical catalogue 10c. Reading Scientific Co., Reading, Pa.

NEW Hydriion pH outfit: 14 color change 14 Buffer solutions; checks entire range within 0.5 pH unit; \$9.50. Leaflet P12 request. R.P.C. Co., 116 Liberty St., New York City.

FREE: 40 page catalog of chemical and laboratory supplies for amateur chemists. Wollensak microscopes and scientific books at big discount. J. Winn, 124 West 23 Street, N. Y. C.

ANALYSIS. Research. Newest guarantee formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemist FD-1142 Sunnyside, Chicago.

MICROSCOPES, mineralogy, chemistry telescopes, binoculars. Catalog Tracey Laboratories, Evanston, Ill.

CHEMICALS, rare and common. Catalogue, 3c. Chemical Service, 2827 Rockwell, Chicago.

JOIN American Amateur Chemists Society. Particulars, Journal 10c. Has Mich.

CHEMICALS in 5c quantities. Catalog Fleischer's Laboratories, Everett, N. J.

DETECTIVES

DETECTIVES, Secret Investigations. Easy Method. Home. Travel. Particulars Free. Write, International Detective Training, 577-P Orpheum Bldg., Jersey City, N. J.

DETECTIVES earn big money. Make secret investigations. Experience unnecessary. Detective particulars free. Write George Wagoner, 2640-P Broadway, N. Y.

DOGS, BIRDS, PETS

RINGNECK, Golden, and other pheasant wild turkeys. Lawrence N. Taylor, Shadowhurst Farm, Glen Moore, Chester County, Pa.

RACCOONS, Minks, Skunks. Domestic breeders, pets. Instructive, interesting catalog, 10c. Shaday Fur Farm, Springfield, Minn.

OLD English sheepdogs. Unusual! Uncommon! Devoted! AKC Typical Custer Kennel, New Rumley, Ohio.

EDUCATIONAL & INSTRUCTION

TERRESTRIAL Globes. World in turn War rampant! Intelligent understanding of events makes geographic globe indispensable in home, school, and office. Perbly-colored 7" globe, \$1.00; 10" \$1.50. Free booklet included. "Know World." Unusual buy. Ideal Christmas gift. American Scientific Specialties, Box 6, Ft. Hamilton Station, Brooklyn, N. Y.

WORK for "Uncle Sam." Start \$2100 year. Steady increase. Depend on Men, women. Try next examination. Common education sufficient. List particulars telling how to qualify for them, and sample tests. Free. Write today Franklin Institute, Dept. E48, Rochester, N. Y.

500,000 USED correspondence courses and educational books. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Send name, Nelson Co., 3337 Manhattan Building, Chicago.

USED correspondence courses and Educational Books sold or rented. Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 Bargains. (Courses bought). Lee Mountain, Pisgah, Ala.

FOREST jobs available \$125-\$175 month.. Cabin, Hunt, trap, patrol. Qualify immediately. Write Rayson Service, C-61, Denver, Colo.

STENOGRAPHER—Typist examination; complete home study course, 65 cents. Merit Publications, Munsey Building, Washington, D. C.

IF you like to draw, sketch or paint—Write for talent test (no fee) Give age and occupation. Write G. W. Inc., Dept. PS-26, New York City.

EARN watchmaking. Lessons, Elgin model, trial tools, wholesale bargain watch, pool, material, catalog; all for \$1.00. Stewart Watches, 721 Olive, St. Louis, Mo.

EARN to sell in one powerful lesson from successful salesman, \$1.00. Louis D. Maynard, 156 Sandwich St., Plymouth, Mass.

NEW book shows how to make any ship model. Short cuts, kinks, plans, 100 illustrations, only \$1.00 postpaid. Eugene Watson, Dept. C-128, 353-4th Ave., New York.

BECOME a columnist. Pamphlet free, 10 years experience. Ben Arid, Station D, Los Angeles.

EARN tool, die, machinist work, screw-machines. Booklet "G" free. Allied School, 615-W Lake, Chicago.

CIVIL Service home study courses, 65c to \$1.00. Write for list. Merit Publications, Tunney Bldg., Washington, D. C.

EARN scientific hypnotism; complete course 25c. Sauro, 1754 Weeks Ave., New York City.

"GROW-RICH." Information 10c; professional graphologists' chart, 50c. E. Buchan, Alpha, Minn.

ELECTRICAL SUPPLIES & EQUIP.

MAKE Money electroplating! Marvelous patented invention plates with electric wash, easy as painting. Does same beautiful permanent electroplating; gold, silver, nickel, cadmium, etc., as big tank outfit. No liquids, lightweight, portable. Anyone can use from battery or household current. Only \$6.85 complete. Write for details and sample of work done. Warner Electric Co., 360 N. Michigan, Dept. A-20, Chicago.

WINDING Electric Motors! Diagrams, sketches, tables, etc. for rewinding series motors, repulsion motors, repulsion-induction motors, split-phase motors, AC motor, DC motors, 3-phase motors, generators, etc. Technical bulletin \$1.00. Readers Service, 800-48 North Clark, Chicago.

TRA Violet, Infra Red, Dual ray health lamp. Two separate units in one. Promotes sun tan. Vitamin "D." Automatic control, AC-DC current. \$3.90 postpaid. Details. Beyer Mfg. Co., 4515-Q Cottage Grove, Chicago.

BEAUTIFUL transparent dry electric Shaver, \$3.98, like \$15.00 machine, sent COD. Year guarantee. Magnifying Shaving Mirror Free. Monroe Sales, 520 First National Bank, Springfield, Ohio.

HORSE 1750 speed, repulsion induction, alternating motor \$22.50. 1/4 horse. 10. Others. Electrical Surplus Co., Milwaukee, Chicago.

CTRICAL experimenter supplies, magnet wire, insulating materials, etc. Send for complete catalog. Autopower, 405 Hoyne Avenue, Chicago.

ELECTRO-Scribe: Electric Pencil writes engravings all metals. \$1.00 postpaid. Details. Beyer Mfg. Co., 4515-Z Cottage Grove, Chicago.

APPROVED hearing aids, batteries. Big savings. Trial basis. 363 N. E. 76 St., Miami, Fla. Literature 3c.

ENGINES, MOTORS, ETC.

ELECTRIC shaver \$2.00; 1/4" drill \$3.67; candid type camera \$2.49 postpaid. Home workshop tools. Motors. Bargain pricelist free. Mailorder Electric Co., 705 South Dearborn St., Chicago.

AIR Compressors, new, 1 3/4 x 1 3/4, \$6.00. 2 x 2, \$7.00. 2 1/2 x 2, \$8.00. Guaranteed. Send check or money order. National, 560 Washington, Chicago, Ill.

WAIN. 1/2 HP motors. 60 cycle. 1 phase. 110 volt, like new, guaranteed. \$8.25. Send check to Erie Electric Motor Co., 121 Church, Buffalo, N. Y.

MOTOR rewinding lessons, illustrated. Send stamp for particulars. Motor Data, Box 7631, Kansas City, Mo.

REFINE used motor oil without cost. Particulars. Gerwin, Fairview Oklahoma.

FARM LANDS

40 ACRES, near White River, unimproved; poultry land, \$175; \$5 down, \$5 monthly. Free list and literature. Hubbard, 269 Grossman Bldg., Kansas City, Kan.

FARMS For Sale: Maine to Florida. California. Free Catalog 2000 Bargains, many with stock, tools, crops. Strout Realty, 255-ZB 4th Ave., N. Y. C.

BRONDAKS. Sportsmen Paradise. Charles Tyre, Corinth.

FENCING

FENCING equipment. Foils, swords, masks, etc. Low prices. Free catalog. Industrial Products, Dept. E111, 48 West 48th Street, N. Y.

FIELDGLASSES, TELESCOPES & MICROSCOPES

BUILD reflecting telescopes, 6" kit, \$3.50; other kits; all abrasives, mirrors, eyepieces, diagonals, illustrated instructions, 10c. Catalog free. Optical Development Corp., 1560 Broadway, New York.

USED microscopes, binoculars, astronomical telescopes—Bought, sold, repaired. Send 10c for list. Rasmussen, P. O. Box 294, Amsterdam, N. Y.

MICROSCOPES, Slide making supplies, reagents and stains. Send for free circular M38, Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

TELESCOPES, Microscopes, Binoculars; 1938 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

TELESCOPES, binoculars, microscopes. 1938 Bargaingrams free. Hobby Man, Jefferson, Iowa.

MICROSCOPES, mineralogy, chemistry, telescopes, binoculars. Catalog free. Tracey Laboratories, Evanston, Ill.

MAKE powerful telephoto camera. Trifling cost. Jamer, 94E. Manorville, N. Y.

FOR THE HOME

CHRISTMAS cards, all folders, 100 for \$1.00. Beautiful Hamilton dry shaver, AC, DC. Guaranteed. Chromium head. Never before at \$3.00, postpaid. Sally, 162 West 96th Street, New York.

KEEP cellar free of Fly Ash when filling ash can. Photo, instructions 25c. P. O. Box 451, Cincinnati, Ohio.

FOR INVENTORS

PATENT your idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-nine years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 59-M Victor Building, Washington, D. C.

INVENTORS: Sell your invention, patented, unpatented. "Inventors Marketing Guide" lists name, title, company of 1200 selected executives. Classified by industries. Every executive, qualified engineer, understands your language. Sample sales letters. Tells who to sell and how. Save commissions. Order today, \$1.00. Inventors Marketing Guide, Box 42, East Lansing, Mich.

INVENTORS—Time counts. Don't risk delay in patenting your invention. Write for new 48-Page free booklet. "Patent Guide for the Inventor." No charge for preliminary information. Clarence O'Brien and Hyman Berman, Registered Patent Attorneys, 697-2 Adams Bldg., Washington, D. C.

INVENTOR'S Universal Educator; contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1 postpaid in U.S.A. Address Albert E. Dietrich, 681-A Colorado Bldg., Washington, D. C.

INVENTORS: Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 413 Bowen Building, Washington, D. C.

IDEAS and Practical Inventions developed and promoted. Protection guaranteed. Blue print and engineering service. Write for 4-Point Service bulletin. R. & S. Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. SF-12.

INVENTORS: Sell your unpatented invention with positive safeguards under patent laws. New low-cost procedure. Complete details free. American Patents Corp., Dept. 30-E, Washington, D. C.

HAVE you a sound practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 3-A, Washington, D. C.

CASH for unpatented ideas. Stamp appreciated. Mr. Ball, 9441-B Pleasant, Chicago.

WE locate buyers meritorious patented, unpatented inventions. If would accept reasonable cash or royalty, write Inventions Reporter, 3A-11236 So. Fairfield, Chicago. Booklet free.

INVENTORS: State lowest price for your invention, and send details at once to Adam Fisher Company, 183 Enright, St. Louis, Mo.

DEVELOP. Protect. Sell. Your invention without patent. Valuable instructions, guide chart, 25c coin. Manual Publ., B-11, Box 458, Chicago.

INVENTORS, let's cooperate, share profits. Free copyrighted pamphlet. Inventors Cooperative Company, Cornwall, Canada.

INVENTORS: Protect your ideas during development. Complete details free. Nuway, 8817 Marcellus, Detroit, Mich.

IF you have a practical invention for sale, write National Service Bureau, Dept. K-1, St. Louis, Mo.

INVENTIONS bought, sold. Patented, unpatented. James Wallace, Homer, N. Y.

FORMULAS, PLANS, ETC.

FORMULAS: 15 proven moneymaking formulas \$1.00. (Not stock-formula catalogue stuff), real unusual offers. List free. Marvel Laboratories, 6629 No. Maplewood, Chicago.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FA-1142 Sunnyside, Chicago.

THAXLY formulas for perfect products. Accurate analysis assured. Resultful research. Catalog free. P. Thaxly Co., Washington, D. C.

GUARANTEED formulas. Lowest prices. Catalogue free. Kemico, 500-N Park Ridge, Ill.

FORMULAS—Latest Money Makers. Literature Free. E-Belfort, 4042 N. Keeler, Chicago.

FORMULAS: Three famous money makers, \$1.00 Cash. Mobley, Box 3176, Hollywood, Calif.

ANY Formula \$1.00! (Luminous paint formula \$1.00)! Galluzzo, Wilkinsburg, Pa.

GAMES, ENTERTAINMENT

BIGGEST bargain in records ever offered. 250,000 double face 10 inch records, made by Decca, Brunswick, Vocalion, Blue Bird, Perfect, Victor, Melotone; electrically recorded; over 1,000 different selections of swing, vocal, dance, instrumental, sentimental, Hill Billy, etc. Special 12 for \$1.00; 25 for \$2.00 regular 35c to 75c values. Also RCA-Victor Record Player No. R-93-C an all electric machine; connects to any AC radio; regular \$15.00. Our special price \$7.85. Modell's, 51 Cortlandt St., New York.

PLAYS, operettas, musical comedies, complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologs, dialogs, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 203 N. Wabash, Dept. 26, Chicago.

PASTIME for the whole family, 1000 problems. Interesting and educational, 25 cents. No stamps. Watchman's Puzzle, 105 Brookview Ave., Troy, N. Y.

FREE! Magic catalog 500 tricks. Amaze, mystify friends. Write today! Lyle Douglas, Station A-10, Dallas, Texas.

SHUF-L-BORD, played anywhere. Extremely entertaining. Details free. Lange, R803, 20 East Jackson, Chicago.

HELP WANTED

M.M. earned \$267.00, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 241, Chicago.

IF you are ambitious you can make good money with a Rawleigh Route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box L-2-PSHW, Freeport, Ill.

HIGHGRADE SALESMEN

DISTRICT Managers, field representatives, age 30 to 60, for a well established company to investigate and interview dealers for a new automatic system all cars need; method makes sensational and truly convincing demonstration; a proved dealer merchandising plan, which is covered by insurance; large earnings now and on repeat business; exclusive territory section. Craver-Jay Corp., Kansas City, Mo.

AMAZING invention closes all doors silently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Unlimited market, stores, offices, factories. Free demonstrator furnished workers. Kant-Slam, Dept. E92, Bloomfield, Ind.

MAKE more money with Red Comet Automatic Fire Extinguishers. Low Price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 744 Red Comet Building, Littleton, Colo.

MAGIC electric brush. Retail \$1.50. Your profit 75c. Uses static electricity. No wires, batteries or expense. Carry in your pocket. Unbreakable. Send for sample and particulars. Donald Brush Company, Household Division, Camden, N. J.

MAKE big daily cash profits. Sell top quality advertising book matches, part time. Experience unnecessary. Full time profits unlimited. Free sales kit. Free zip-percase offer. Match Corporation of America, Dept. N-12, 3435, 48th Place, Chicago.

SALESMEN: Amazing magnetic brush, pocket size, creates static electric suction. Excels vacuum cleaner. 200 other fast sellers. Neway Brush Co., Hungerford St., Hartford, Conn.

BIG Money taking orders; Shirts, Ties, Hosiery, Underwear, Raincoats, Pants, Dresses, etc. Sales Equipment Free! Experience unnecessary. Write Nimrod, 4922-AV, Lincoln, Chicago.

SALESMEN. Sell calendars. Complete line, all sizes including Jumbos; beautiful subjects. Samples free! Fleming Calendar Co., 6539 Cottage Grove, Chicago.

ROTEX something unusual in natural Christmas card tie-up for men who can sell. Sample 25 cents. Large commissions. Edward Lock, Box 1476, Washington, D. C.

BALLGAMES, movies afternoons. Work mornings home, your own business. Introductory Booklet Free. Stamford, 3762-r Broadway, N. Y.

HOME CRAFTSMEN

PLYWOOD at Wholesale. Everything in plywood and veneers for the professional and amateur craftsman. Complete stock of foreign and domestic woods at wholesale prices. Send 10c for new interesting catalog. Your dime refunded on first order. Beck Plywood & Veneer Co., 1308 N. Halsted St., Chicago, Ill.

SQUAREKNOTTERS! Make belts, handbags, etc. Quality cord samples with catalog, free. Beginners book, catalog and samples, 10c. Special! Regular \$1 book with 50c beginners outfit, all for \$1. P. C. Herwig Co., Dept. P-12, 121 Sands St., Brooklyn, N. Y.

HEADQUARTERS for home craftsman machinery and equipment, bought and sold. Lathes, cutters, scroll saws, etc. If you want to sell, get our offer first; if you want to buy, send for bargain price list. Craftsman House, 315B Harding St., Avoca, Penna.

MEXICAN designs for making pictures from wood. 20 patterns, complete instructions 25c (coin). 20 cowboy novelty patterns, 25c. 10 lawn ornament patterns, 15c. Mexican Arts, Crafts, Box 332, Eagle Pass, Texas.

ATTENTION Woodworkers. Join America's most active woodworkers club. Receive many benefits. Send 25c for your membership card and registration number. O. A. Stone, New England Club Associate, Richford, Vt.

DESIGN your own furniture. Our complete course shows you how. Only \$8.50. Invaluable to home craftsmen. Write for descriptive folder. Klok Institute, 430 Lyon, Grand Rapids, Mich.

PLASTICS: How to work with this new material. Plans for 50 projects; lamps, trays, clocks, jewelry, dresser sets, etc. 232 page instruction book, \$1.00. Readers Service, 800-48 North Clark, Chicago.

JIG and band saw blades, venetian blind supplies. Literature upon request. Send 3 cent stamp for two plain end sample blades. Homecroft Supply, Box 101, Aurora, Ill.

KNOCKDOWN furniture, lumber, plywood, veneers. Illustrated catalog 10c. Giles-Kendall Co., Decatur, Alabama.

IVORY tusk ends, 60c. Inlay pieces \$1.00 lb. Raljan, Fairport, N. Y.

BIRDSEYE maple projects. Literature 3c. Riley Novelty Shop, Grandville, Mich.

15 FULL-SIZED lawn ornament patterns 30c. Modern Woodcraft, Saginaw, Mich.

SUFFICIENT cedar for chest sixteen by eighteen by forty, \$4.40, freight paid. Sportswood, Ironton, Mo.

INVENTIONS WANTED

"WORKING With Bentonite"? (Hycoloidal Clay). Amateur scientists and investigators we will aid or buy any new developments you have involving Bentonite Clay. For free samples and further information write: The Wyodak Chemical Co., Department F, 4600 East 71st Street, Cleveland, Ohio.

PRACTICAL Inventions Wanted. Full protection guaranteed. Write for "4-Point Service" bulletin. R. & S. Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. S-12.

SMALL inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. S. Hull, 7829-M Euclid Avenue, Cleveland, Ohio.

WANTED: Meritorious patented, unpatented inventions. Booklet free. Invention Reporter, 3B-11236, South Fairfield, Chicago.

INVENTIONS. Patented, unpatented, bought outright, royalty. Write, Arellano-Power Co., Box 1827-S, Chicago.

MACHINERY, TOOLS & SUPPLIES

SOUTH-BEND 9" Lathe milling attachment, universal movement, \$9; threading dial indicator, \$3; circular free. Unique Manufacturing Co., 4807 No. 31st Ave., Omaha, Nebr.

ONE inch chrome precision micrometer, \$1.15. Send for free 1939 illustrated tool booklet. Homecraft Tool, 236 Neptune Ave., Brooklyn, N. Y.

BARGAINS, demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Hobart Welder Exchange, Box P-1282, Troy, Ohio.

MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

LOOK! Joke goods! Pocket tricks! Unusual novelties! Strange curiosities! Startling magic! Thrilling puzzles! Lowest prices. Complete line. Send 25c for Giant surprise catalog. Lawson Vick Co., Dept. 12, Queens Village, N. Y.

KNIFE throwing secrets exposed! Beginners and experts get this book now! 40 tricks and throws used by professionals. \$1.00 postpaid. Frank Dean, 1294 E. San Fernando St., San Jose, Calif.

FREE! Magic Catalog 500 tricks. Amaze. Mystify friends. Write today! Lyle Douglas, Station A-1, Dallas, Texas.

LARGE Magic Catalog 25c. Over 600 Tricks. Established 1910. Chicago Magic Co., A-2300 North Mason, Chicago.

FREE tricks! Join Magicians' Fraternity! Monthly magazine, sample 10c. International Magicians, Mt. Morris, Ill.

LARGE Professional magic catalog, 25c. Holden, P-220 W. 42nd St., N. Y.

MAGICAL coin and large magic catalog 25c, coin. Gem, D-26, Wollaston, Mass.

MANUFACTURING

LAM-A-FAB, the cloth cement, acid and waterproof. Permanently repairs anything made of cloth. Sails, hunting suits and equipment, football suits and athletic equipment, rugs, canvas chairs, work clothing, etc. S. J. Russell Co., Box 187, Peoria, Ill.

INVENTIONS manufactured in any quantities. Tools, dies, metal stampings; working models built; industrial designing. Complete blue print and engineering service. Write for "4-Point Service" bulletin. R. & S. Engineering Company, 17 East 42nd Street, N. Y. C., Dept. SM-12.

ANALYSIS, Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FE-1142 Sunnyside, Chicago.

MANUFACTURING tools, dies, stampings, models. Federich Tool Co., Box 10, East McKeesport, Penna.

MISCELLANEOUS

500,000 USED correspondence courses and educational books. Sold. Rented. Exchanged. All subjects. Satisfaction guaranteed. Cash paid for used courses. Complete details and bargain catalog free. Send name. Nelson Co., 3611 Manhattan Bldg., Chicago.

FREE literature how to locate buried treasure and minerals. Fisher Laboratories, Palo Alto, Calif.

HAND turned hollow woodenware. Price-lists. James C. Brown, Painesville, Ohio.

NEW Patented Electric Pencil Set. Writes in all beautiful colors, gold, silver, etc., on any material, leather, wood, paper, bakelite, rubber, cellophane, etc. \$1.50 post paid. Machinery Sales, 192 N. Clark, Chicago.

BOOKBINDING unit that does the entire job, vocational schools, libraries, job shops, hobbyists. Practical. Low priced. Write Pratt, A-10, 4227 Euclid Ave., East Chicago, Ind.

BUCKEYES: real Mountain Buckeyes have been carried for years for Rheumatism, Luck, etc. Send \$1.00 bill for matched pair. Edy the Druggist, Beckley, West Va.

FREE by-product used as building material replaces brick. Obtainable anywhere. Saves half. Information free. Burton W. Macon, Ramseur, N. C.

FIRE extinguishers, all types. Recharges, repairs. Buy wholesale. Armington, Sycamore, Ill.

MODELS & MODEL SUPPLIES

LIVE Steam Locomotives from \$9.50, \$150.00. New Hudson scale model now ready, also parts to change electric locomotion to steam driven. Send 25c for catalogue. 14-inch cardboard illustration of Hudson with parts to cut out, assemble and operate, to demonstrate piston and valve action, 50c postpaid. Steam Electric Co., Bloomfield, N. J.

STEAM locomotives! 1/4" scale. Build one by "Easy Steps." Our illustrated catalog lists all needs, 25c. Little Engines, Wilmington, Calif.

PLASTICS, brass, aluminum, monel, stainless steel, supplies in small quantities. Catalog 10c. Hobby Supply House, Box 2014, Pittsburgh, Penna.

POWER models, steam locomotives, electric railways, gasoline, steam engines, ship machinery, accessories. 84 page catalog 35c. Charles Cole, Ventura, Calif.

CATALOGUE of over 40 engines—castings—supplies, 25c. Refunded. Howardco, P-2417 North Ashland, Chicago.

MODEL Railroad shop, Dept. PS. Dunellen, New Jersey. New 24 page illustrated catalog 10c postpaid.

MODEL supplies for the inventor. Send 3c stamp for catalog. Pierce Model Works, Tinley Park, Ill.

BUILD 18" Flying Cloud, Constitution, others. All materials, plans, \$1.50. Hancock, 323 Douglas Ave., Portsmouth, Va.

GASOLINE engine for model power boats; complete, tested, \$12.00. Circular 10c, stamp. Anton Bohaboy, Rahway, N. J.

RAILWAY models. Catalog handbook 25c. Walthers, 259 E. Erie, Milwaukee.

RAILROAD information-catalog, 10c. Lange's, 20 East Jackson, R818, Chicago.

MODEL Makers Lathes. Photographs for Dime. Depoy Model Shop, Muncie, Ind.

MODEL airplane and boat accessories. Catalog 5c. Selley, 1375 Gates, Brooklyn, N. Y.

MONEY MAKING OPPORTUNITIES

MAN in each town to Plate Auto Parts. Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. G., Decatur, Ill.

START Profitable business at home making "Instant Solder." Does wonders. Fast seller to agents. Complete formula and advertising copy, \$1. Worth Darst, Leonard Tex.

IF you are ambitious you can make good money with a Rawleigh Route. We help you get started. No capital or experience needed. Steady work for right man. Write Rawleigh's, Box L-2-PSMO, Freeport, Ill.

"SCHEMER." Alliance, Ohio, (40th year) prints schemes, tips, ideas, opportunities, formulas; big producers. \$10,000 to \$25,000 reported. Year \$1.00. Now get wise. Six months, 30c.

SUCCEED. With your products. Make. Sell them. Formulas. Processes. Accurate Analyses. Catalog Free. P. Thaxly Company, Washington, D. C.

MILLIONS Jobless! Get dollars in mail for satisfying employment information. Keep dollars! We fill your order. Details for stamp. Co-Operative Service, Room 213, Swan, Buffalo, New York.

ATTRACT capital and ideas to start order or national business. Send 25c copy "Money Magazine." Peekskill, N. Y. Ask for "How to Find the Man" folder. Copies free.

"RAISE Earthworms for Profit" Information Free. Stamp Appreciated. Bureau Zoological Research, 106 P Broadway, Peoria, Ill.

MAKE fireworks during spare time at big profit. Full instructions. Dictionary of Pyrotechny, \$3.00. Geo. W. Weingart, 3902 Ursuline Ave., New Orleans.

INVENTION Finance Magazine 80-N Wall Street, New York. Free particulars concerning contents of magazine given to prospective subscribers. Inquire at once.

MAKE money growing plants in water indoors during winter. Weighed chemicals, instructions, formula, \$1.00. Gordon Laboratories, 509-W Fifth Ave., New York.

OPPORTUNITIES! Hundreds of money making plans, ideas, etc. Unusual offer. Send for free details. Fox, 608 Rogers Ave., Brooklyn, N. Y.

\$192.00, K's WEEKLY earnings. Above average, but maybe you are too! 205 Moneymaking Plans. Introductory Booklet Free. Stamford, 3762-p Broadway, N. Y.

YOUR name—5,000 mailing lists—25c. Get samples, opportunities galore from all over world. Pines's, 583 Monroe, Brooklyn, N. Y.

THREE-WAY money-making business. Local or mail order. Send for free circulars. Ps. Kohn, 506 W. 45th, Chicago, Ill.

90% PROFIT mailorder opportunities. Literature free. Harvey Teeple, Decatur, Ind.

EARN money addressing envelopes, circulars, typing. Information 10c. None free. Ace-PSMH, 322 Empire, Birmingham, Ala.

PROSPERITY for home workers. 52 page magazine. Sample, dime. C. Sizemore, 4917 N. Kostner, Chicago.

MAKE \$4.75. Easy clerical duties. Details, magazine "Side Money," 10c. Wilsons, 2408 Pine, Everett, Wash.

YOU'LL like resilvering mirrors, autoparts, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 920, Marion, Ind.

AFTERNOONS Free! \$300 mo.—home! No canv. Expect surprise! Folio, Sta.-D, Los Angeles.

PRACTICAL money making plans; literature free. Silvester, LB217, Old Bridge, N. J.

50 PAGES 100 money making plans formulas 25c. Beck, 317 W. 109th, N. Y.

MOTION PICTURES & SOUND EQUIPMENT

NEW, novel "Bargainingram" right off press. 1,500 Movie Specials, Sound, Silent, 8, 16, 35mm. Used, new. Films, cameras, projectors, screens, accessories. Rental library. We trade, rent, buy, sell. Mogull's, 66 West 48th, N. Y.

8-16MM FILMS. Sale, rent, exchange. Films rented everywhere. Bargains in equipment. Free illustrated catalogue (with sample film, 10c). Garden Exchange, 317 West 50th, New York.

GENERA film, 200 feet 8 mm, \$1.75, postpaid. Separates without slitting. Any 8mm camera. Sample free. Process it yourself with powders. Fromaders, Davenport, Iowa.

CHRISTMAS film complete, 16mm \$1.85, 8 mm 98c. Order today. Movie cameras, projectors, films, accessories. Free lists. Home Movies, Box 216S, Easton, Pa.

HOLLYWOOD Titles made easy. Trace. Artistic Tinting Charts, \$2.00 complete. Samples, 3c. Stein Studios, 949 Broadway, New York.

WORLD'S Fair film; 8mm, 16mm, American Legion sports. Projector camera bargains. Free catalogs. Write Gravlee and Son, Kennedy, Ala.

BEST Camera Film; 16mm, 100 feet, \$2.39; 50 feet, \$1.37; processed free. 8mm, 50 feet, \$1.37. Goodwill Company, Jackson, Tenn.

LEARN Motion Picture Theatre Management, Advertising, Projection. Free catalogue. Give age. Theatre Institute, 375 Washington, Elmira, N. Y.

16mm VELOTEX. Perfect outdoor film. 100 ft. Rolls \$1.95 including processing. Sample free. Velotex Laboratories, Gary, Ind.

MOVIE films 8mm-16mm. Reduced prices. Free list. Crown Film Corp., E-42 Melrose St., Boston, Mass.

OUTDOOR film cheap; Univex 33 1/3% off. Duplicates. Nichols, Demorest, Ga.

MM FILMS sold and rented. Lists 3c. C. Hoffman, 57 Broad, Albany, N. Y.

8-MM-16 CAMERAS, projectors, accessories. Free literature. Taylor, Bx 234, Corning, N. Y.

PROJECTOR Film; 16-8mm, sample 10c; lists free. Goodwill Company, Jackson, Tenn.

8-16MM. TITLES. 2c word. Literature free. Cine Shop, 1812 Piedmont, Charleston, West Virginia.

BARGAINS! 35mm films, projectors. Stamp. Demsey, 1223 Berkley, Youngstown, Ohio.

MOTORCYCLES, BICYCLES & SUPPLIES

MIDGET Racers, Motorcycles, Bullet Sidecars, Sport Trailers, Rocket and Air-propelled Ice Boats, Speedboats, Super-charged Racing Hydro's, Sportcars, Pictorial Blueprints of 100 different streamlined sportcraft designs for amateur mechanics, speed fans, modelmakers. Complete collection \$1.00 prepaid. Sportcraft, 5504 Lisette, St. Louis, Mo.

ARIEL, B-S-A, Norton, Rudge, Triumph and Velocette motorcycles completely described in our large illustrated pamphlet. Send 10c now, and we include the Pink-O-Gram for one year. Reggie Pink, 2077 Southern Boulevard, N. Y. C.

RECONDITIONED Motorcycles. New-used parts for all makes. Authorized Harley-Davidson Dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

SEND 15c for Illustrated Used Motorcycle Catalog. Bargains. Largest stock, genuine Indian Parts and Motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

MOTORCYCLE bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 131 W. Main St., Rochester, N. Y.

BUILD your own motor scooter. We furnish parts. Literature dime. Drawings free. Comet Cycle Co., Box 3032, Madison, Wis.

MUSIC, MUSICAL INSTRUMENTS

WANTED original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers, Ltd., Dept. 96X, Toronto, Canada.

LEARN swing piano! Postal brings free folder. Christensen, 765 Kimball Hall, Chicago.

VIOLINS. Handmade masterpieces, best since Stradivarius. Lehto, 935-14th San Pedro, Calif.

SONGPOEMS wanted. We publish. Free Melody. Songland, "PS," Thomaston, Me.

PHONOGRAPHS. Parts. Supplies. Portables \$4.95. Records 6c. Epstein's, A50 First St., New York, N. Y.

DANCE orchestrations; sheetmusic, 15-\$1.00. Silverman Musicmart, 3303 Lawrence, Chicago.

VIOLIN-making supplies, patterns, instructions. Free catalog. Fraser, 1011 Stark, Saginaw, Mich.

OLD GOLD, WATCHES, ETC.

GOLD, \$35.00 ounce. Ship old gold teeth, crowns, jewelry, watches; receive cash by return mail. Satisfaction guaranteed. Dr. Weisberg's Gold Refining Company, 1502-G Hennepin, Minneapolis, Minn.

PATENT ATTORNEYS

INVENTORS: send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With book we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-nine years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 58-P Victor Building, Washington, D. C.

FREE books tell all! What to do with your invention? Patent facts clearly explained. 63 years' experience at your immediate service on easy budget payment plan. Write today for free copies of interesting booklets and "Certification of Invention" form. C. A. Snow & Co., 2125 Snow Building, Washington, D. C.

PATENTS. Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 697-M Adams Building, Washington D. C.

PATENTS. Send sketch, photos or model and description of your invention for preliminary search and patentability report. Total expenses, including search fee, for preparing, filing and prosecuting your application quoted before you proceed. Rates reasonable. Prompt and efficient services. Lynwood B. James, Registered Patent Attorney, Established 1913, Suite 843-B National Press Building, Washington, D. C.

INVENTORS. Protect your rights before disclosing your invention to anyone. Form "Evidence of Conception"; "Schedule of Government and Attorneys' fees" and instructions sent free. Lancaster, Allwine & Rommel, 413 Bowen Bldg., Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention." Free. Frank B. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, N. Y.

WE successfully sell inventions, patented and unpatented. Write for proof and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 3-B, Washington, D. C.

INVENTORS—send for free copy my 72-page book on patents. Reasonable terms. Prompt action. Confidential, personal service. L. F. Randolph, Dept. 340-A, Washington, D. C.

PATENTS. Protect your idea by securing free "Proof of Invention" folder. Exceptional personal service. Established 1906. E. E. Vrooman, 888 Woodward Bldg., Washington, D. C.

BEFORE you take any steps write for our 4-Points of Service for Inventors bulletin. R&S Engineering Company, 17 East 42nd Street, New York, N. Y., Dept. SP-12.

PATENTS—trade marks. Preliminary advice, book and disclosure form free. Personal service. Irving L. McCathran, 1050 International Bldg., Washington, D. C., Registered Patent Attorney.

PATENTS—Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

"PATENT Particulars" and blanks, free. Government-registered patent attorney 33 years. Sterling Buck, P-829 F-Street, Washington, D. C.

KARL A. Mayr, Pat. Atty., Reg. U. S. and Can. Patent Office, Engineer, Patents, designs, trademarks; also foreign matters. 21 E. 40th, New York City.

INVENTORS—Send for free booklet "Patent-Sense." Information based on 64 years experience. Lacey & Lacey, Dept. P. S., 635 F St., Washington, D. C.

PATENTS, Gerald P. Welch, Registered Patent Attorney, Plankinton Arcade, Milwaukee, Wis.

PATENTS FOR SALE

HAVE perfected number of coin controlled mechanisms, both semi-automatic and automatic type, suitable for use in vending machines and the like. Also number of drafting devices. Communicate with A. Williams, 435½ Classon Ave., Brooklyn, N. Y.

NEW Cooker. Amazing invention. Reasonable. J. Stevens, Valley City, North Dak.

PERSONAL

LEARN ventriloquism, 3c stamp brings particulars. Smith, Room 702, 125 N. Jefferson, Peoria, Ill.

DIVORCES. Consent, few days; others 30. American Attorney, Box 1736, El Paso, Texas.

150 DESCRIPTIONS, names, addresses, 25c. Thirty, 10c. Hywestp, So. Haven, Minn.

JOBS in South America. How and where to obtain information about them. If interested send stamped self-addressed envelope. Julius, 517 East Tenth, Amarillo, Texas.

IF a victim of sinus or catarrhal infection, write National Laboratories, 577 Benj. Franklin Station, Washington, D. C.

\$250,000 "MOVIE Quiz" help in November issue, 20c. Contest Monthly, Brookhaven, Ga.

STAMMERING and stuttering corrected. Send \$2.00 to A. Eyre, Dept. C., Box 762, Norfolk, Va.

PHOTO FINISHING

IMMEDIATE service! Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two Plain Enlargements and 8 guaranteed prints 25c. Sixteen reprints only 25c coin. Candid rolls developed free! Prints enlarged to 3x4, only 4c each. One day service. Details and mailers free on request. American Studios, Box PS, LaCrosse, Wis.

ROLL Filmachine developed and your choice of (1) 8 finerfotos and 2 professional bromide enlargements; or (2) 16 guaranteed finerfotos or (3) 8 finerfotos and one beautiful oil colored enlargement, 25c coin. Order by number. Finerfotos, Box 898-18, Minneapolis, Minn.

MAIL your rolls to film center of the world. Any 6 or 8 exposure roll developed and printed 25c coin. DeLuxe enlargement coupon free! Photo Finishing Shop, Est. 23 yrs., 500 Genesee Valley Trust Bldg., Rochester, N. Y. "The Camera City."

"THE 16 Service" for larger miniatures. Micrograin or Champlin's No. 15 development of 16 exposure 127, 120, 116 films, with 3x4 1/2 Kodabrom prints, 75c. Guaranteed. Color Craft Studio, Danbury, Iowa.

PROMPT service—quality work. Two beautiful double weight Gloss Enlargements, eight guaranteed neverfade prints, each roll 25c. Excel Photo Service, Dubuque, Iowa.

"STREAMLINE Photos." New! Different! Rolls developed, printed, free Xmas card from best picture 25c. Free enlargement coupon. Streamline Studios, Box 5699H, Cleveland, Ohio.

SIXTEEN sparkling prints, 2 Hollystyle enlargements with roll developed 25c. 20 reprints 25c; 100, \$1.00. Photographic Christmas cards, 10 for 49c; Sample, 5c. Lifetone Studios, A-30, Des Moines, Ia.

FOR the discriminating amateur, roll developed and carefully printed 25c; reprints 3c. Superior workmanship, same day service. Paramount Co., 327 E. 92nd St., New York.

SENSATIONAL offer: five 5"x7" enlargements, 29c; candid enlarged 3 1/4 x 4 1/2, 3c. 36 ex. 35mm rolls finished 3x4, \$1.00. Cardinal Photos, Summit, N. J.

CANDID special: 35mm rolls enlarged to 3 1/4 x 4 1/2, \$1.00. 18mm rolls 60c. 3 1/4 x 4 1/2 reprints, 3c each. Brown Photo Co., 1910-60 Emerson, Minneapolis, Minnesota.

ROLLS developed and two prints each negative, 25c. Twenty reprints 25c. Star Photo Service, Dept. S, 109 North Dearborn, Chicago.

FILM Developing Bargain! Quickest Service! Sixteen prints or two enlargements and eight prints, each roll, 25c. Modern Studios, LaCrosse, Wis.

ROLLS developed, 2 prints each and 2 free enlargement coupons, 25c; reprints 2c each; 100 or more, 1c. Summer's Studio, Unionville, Mo.

35mm ROLLS fine grained developed, good shots enlarged to 3 1/2 x 5"—36 exposures \$1.00. 18 exposures 60c. Ideal Films, Birmingham, Ala.

TWO beautiful enlargements, eight electrogloss prints with roll developed 25c. Mayfair, Dept. A, Box 261, Toledo, Ohio.

GUARANTEED. Roll developed, 16 prints 25c. 20 prints 25c. Quality Photo, Hutchinson, Kansas. (Through error, incorrect prices were given in our last ad.)

ROLL film developed, 1 print each, 2 enlargements, 25c coin. High class work. Quick service. King's Photo, Box 447, Rockford, Ill.

EXCLUSIVE photographs. Samples. Complete list, 25c. Albert McGoldrick, Mansfield, Mass.

BEAUTIFUL photographic Christmas cards, 75c doz. Send negative and 10c for sample. Hench Studios, Harrisburg, Pa.

CONFIDENTIAL developing, two prints each negative 25c. Reprints 2c each. Royal Photos, 3902 North Sixth, Harrisburg, Pa.

PERFECT tone enlargements approximately 4x6 from 127, 120, 116 size negatives. Special, 10c, postpaid. Williams Photo Service, Boise, Idaho.

PERSONAL photographic Christmas cards, calendars. Illustrated circular free. Ideal Photos, Box 2255, Patterson, N. J.

ROLL Developed, two sets prints, enlargement coupon, 25c. Fulton Foto Finishers, Ave. 10, Fulton, Ill.

PLAYS, STORIES WANTED

FICTION writing pays! Sell your stories for cash through "Master Plot Builder." Amazing details free. Morgan Publishers, Hohm Building, Sixth and Western, Los Angeles, Dept. 60.

SCREENWRITERS Handbook. Valuable guide to successful motion picture writing. 25c coin. Limited edition. Broadwell Studios, Bendix Bldg., Los Angeles.

SHORT stories, novels, forcefully rewritten, typed for marketing. Welton Tinney, Winnsboro, Texas.

POULTRY & FARMING SUPPLIES

ALL Purpose Tractors at factory price. Shaw 2 to 5 horsepower, riding or walking types. Does plowing, discing, harrowing, cultivating; mows lawns, cuts weeds, does hauling; runs belt machinery. Air or steel tires. Three speeds forward and reverse. Thousands in use. Write for free catalog and 10 day trial offer. Shaw Mfg. Co., Dept. PS, Galesburg, Kan.

MAKE money with poultry. Read America's leading poultry magazine for latest information. Three years, \$1.00; nine months, 25c. Poultry Tribune, Dept. C-91, Mount Morris, Ill.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, LABELS

LETTERS, circulars, price lists mimeographed, 100, \$1.25, 300, \$1.45. Advertising letters written \$1.00. Mailing service. Louis D. Maynard, 156 Sandwich St., Plymouth, Mass.

HAMMERMILL letterheads, 300 8 1/2 x 11, any color paper and ink; \$1.48 postpaid. Free particulars. Woodruffs, 217D Lewis, Duluth, Minn.

PRINTING designed to please taste and pocket-book. Rush orders our specialty. Samples, state business. Sicoan, 2038 Obear, St. Louis, Mo.

125 LETTERHEADS 8 1/2 x 11 and 125 envelopes, \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

HARVEY labels. Wonderful values. Samples free. 6618G Quimby, Cleveland, Ohio.

6x9 CIRCULARS, letterheads, envelopes, postcards, \$2.95 1000; 5000 \$9.45. Samples. Goodprint, Harrisonburg, Va.

500 LETTERHEADS, envelopes, statements, \$1.50. Richard's Print Shop, 271 S. Grand St., Orange, Calif.

EASY embossing process and sample embossing powder, 25c. Hayes, 60 E. 18th, Chicago.

LETTERHEADS designed especially for you! Sketch free! Gill Art Service, Huntsville, Ala.

SENSATIONAL low printing prices. Guaranteed work. Samples. Woodprint, Woodstock, Va.

BARGAINS: Printing! Mimeographing! Pricelist free! Gordon, B-417, Downers Grove, Ill.

QUALITY printing, reasonable. 5000 circulars (envelope inserts) 3 1/4 x 5 1/2, \$3.50. Farber Press, 740S Eighth Avenue, N. Y. C.

\$2.25—1000: LETTERHEADS, envelopes, statements, circulars. Samples. Midwest Printing, 514M Huron, Minneapolis, Minn.

ENVELOPES, 250 \$1.00. Morey Press, 87 Somerset St., Springfield, Mass.

GET our prices for better printing. Delavan Printery, 177 Freund, Buffalo, N. Y.

500 TWO-color Stickers, 2 1/2 x 7/8", 50c. Fine labels. Cott's, Spickard, Mo.

50 NOTEHEADS, 25 envelopes 25c; or 50 cards. Beasley, Stapleton, N. Y.

PRINTING OUTFITS & SUPPLIES

PRINT your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$9.00, job presses \$11 up. Details free. Kelsey Presses, B-8, Meriden, Conn.

HAND press outfit. Complete \$7.75. Catalogue for stamp. Printers Sales, 11 Howard St., Baltimore, Md.

6x9 press, \$5.00. Bargain literature for Novelty Shop, Downsville, La.

STOCK cuts 40c up. Catalog 10c. Gregory, 79-S. Main St., Belleville, N. J.

PROFITABLE OCCUPATIONS

HOBBY. Grow flowers, vegetables in solution tanks. No soil. Heavy yields. \$1.00 directions and complete chemicals sufficient fifty gallons solution. Box 255, Jarney, Fla.

CHEMICAL-culture. Grow plants, flowers, vegetables with chemicals, no soil. Educational, large yields. Latest formulas and instructions, \$1.00. Louran, Box 755, Rockland, Me.

MINK. Finest easterns and Yukons obtainable. Mink cages, complete \$4.00. Woodall's Mink Farm, East State Street Extension, Barberton, Ohio.

GET into tray farming! Grow vegetables in water. Chemicals for twenty gallon instructions, \$1.00. Chemgardner, 344, Humboldt, Minn.

FIND your proper job. Vocational analysis reveals your abilities. Send 10c for materials. Vocational Guidance Institute, Boonton, N. J.

205 MONEYMAKING Plans; opportunities to make up to \$75.00 weekly, today's conditions. Introductory Booklet Free. Stamford, 3762-s Broadway, N. Y.

AMAZINGLY! Inexpensive opportunities. Dime appreciated. Nesco, Box 904, Middletown, Conn.

MINK raising is fun and highly profitable. Particulars. Empire Mink, Scarsdale, N. Y.

PROFITABLE home work, complete instructions 25c (coin). Webster, 3 Third St., Detroit, Mich.

LAWN and garden novelties, 25 large patterns of the nicest and best \$1.00. Arnold Novelty Co., Holland.

RADIOS, SUPPLIES & INSTRUMENTS

RADIO engineering, broadcasting, station and police radio, servicing, and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge Institute, Poplar St., Valparaiso, Ind.

ATTENTION: Send for free literature describing World's most unusual Mid-Radios. Also Table and Console models factory prices. Tinytone Radio Co., Dept. CPS, Kearney, Nebr.

SAVE money on radio sets, parts, tubes, etc. Send for new summer catalog. United Radio Co., 8-Newark, New Jersey.

1939 RADIOS only \$9.95 Prepaid. Electric Shavers \$7.50. Simms, Warwick, York.

PLANS 18 Distance Record Crystal with "Radiobuilder" year, 25c. Laboratories, 7700-T East 14th, Oakland.

SEND dime for data. New radio electronic devices. Easily assembled. Modern Radio Box 200, Elizabeth, N. J.

FARM Radio (6-tube), \$9.95. Call Marco-E, Kansas City, Mo.

RARE COINS

BIG prices paid for certain wanted 1909 cents \$10.00, some silver \$4000, 1864-1865 Indian head cents each, dimes before 1895 \$600, liberty nickels before 1914—\$500, encased stamps, some large pennies \$200 cents—\$275.00, paper money, gold \$1500, foreign coins \$165, some worth each. You may have coins for which you pay big premiums. Therefore send today for 1939 big illustrated coin book certain wanted coins. National Corporation (2), Daytona Beach, Fla. \$5.00 to \$500.00 each paid for hunt Old or Odd Coins. Keep all until Send 10 cents for illustrated Coin Book, 4x6. Guaranteed Prices. 31 business. Coin Exchange, Box 31, N. Y.

COIN or stamp selling lists free. List 15c. Commemorative half dollars, Texas, Cleveland, Lincoln, Stone Mountain, Elgin or Columbian, \$1.00 each. Hussman, 211 South 7th St., St. Louis.

UNITED STATES, large cent, 2c bro 3c nickel and Bargain list, dates large cents \$1. George E. F. pany, Augusta, Maine.

WE purchase all Indianhead chasing catalogues 10c. A. 100 Forsyth, New York.

MEMORATIVE half dollars, Lincoln, Texas, Oregon, Stone Mountain, Cleveland, \$1.50 each. New illustrated catalogues 25c. Norman Shultz, Salt Lake City, Utah.

WOOD Wooden Nickels. Commemorating Northwest territory, 12c. Postman's Knock, Rossmoyne, Ohio.

NCIRCULATED San Francisco mint cent and list, 10c. 3 different, 25c. Landon, 1 Lucerne, Los Angeles.

DIFFERENT Coins, 25c. Bishoff, 500 E. 8th, Kansas City, Mo.

FREE foreign coins and price list 10c. Joseph Coffin, 1182 Broadway, New York.

COINS, 25c. 30 bills, 25c. 35 tax tokens, 25c. Otto Oddehon, Unionville, Mo.

RUBBER STAMPS, OFFICE SUPPLIES

VELOPES, 1000-6 $\frac{3}{4}$'s, \$1.75; 1000-10's, \$2.85; 100 sheets carbon paper \$1.50 Prepaid. "Everything for the Office." LaBahn, 13 Main, Evanston, Ill.

AVE half! Typewriters, duplicators, addressographs, dictaphones, checkwriters, terms 10c per day, 10 day free trial. Rite, Pruitt, 978 Pruitt Bldg., Chicago.

SCIENTIFIC EQUIPMENT

TAR Gazing. Know and find your stars with a Wez Planetarium \$3.50. Particulars 3c. Box 558S, LaJolla, Calif.

SONGWRITERS

ONGWRITERS: Avoid common, costly errors of amateurs. Free, instructive, authoritative booklets by famous Broadway composer, will guide you to better, more marketable manuscripts. Write today. Songwriters Institute, 1234-J Broadway, N. Y. C.

MEM writers, songwriters-Send for free Rhyming Dictionary, Songwriters' Guide. Submit best poems, melodies today for special, superior offer. MMM Studios, 100 E. Portland, Oregon.

Composed to words. Rhyming booklet on request. Phonograph recording of completed song. Send Poem. Mann's Studios, Dept. PS, Box 2140, Hartford, Conn.

Original poems, songs, for immediate consideration. Send poems to Columbia Music Publishers Ltd., Dept. Toronto, Can.

NG poems wanted immediately. Outstanding proposition. Standard Song Service, 1412 Great Northern Bldg., Chicago.

GWRTERS: Send your poem today for immediate consideration. Richard Hers, 146 Woods Bldg., Chicago.

GWRTERS wanted, write for free book, 50-50 plan. Song Bureau, Dept. L, N. Ind.

WRITERS! Outstanding, amazing offer. Hibbeler, C-15, 2157 N. Avers, Chicago.

your poetry! Information free. Music Publications; Division 132, 3923 Sixth Street, Los Angeles, Calif.

WRITERS, Verse or music. Brilliant opportunity. Write immediately. Vandyke, 76 Rockhaven, Ky.

5, Poems, wanted immediately. Free Metro-Melody Publishers, 532 San Francisco.

WRITERS, poems, wanted immediately. Glen Warren, 1560 Broadway, New York City.

Y for words, \$1.00. Littig, 215 Theatre, Los Angeles, Calif.

Poem, Melody Writers. Write to PS1, Guaranty Bldg., Hollywood.

FISHING TACKLE, ARCHERY

uns? If you enjoy shooting or tinkering with firearms, send nine cents in for sample copy The American Rifle Association, 899 Barr Washington, D. C.

MEMBER to the leading archery magazine. Covers all phases of archery. One dollar per year, 10 cents for sample copy. American Bowman-Review, Albany, Ore.

OFFES. GOLF Secrets. The inside story of the Dub Class. Par-Golf Secrets, Department K, Chicago.

attention! Lowest prices for fishing tackle. Free catalogue. Russell Christiansa, Chicago.

LEARN Gunsmithing at home. Repair your own and neighborhood's firearms. Free catalog describing 20 books on firearms and gunsmithing. Tom Samworth, Marines, North Carolina.

HEADQUARTERS for bows and arrows, materials and supplies. Catalogue Free. Instruction Book 50c. Archery, 617 South State, Chicago.

HUDSON Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box PS, Coopers Mills, Maine.

GUNS, Sights, Binoculars. Lowest Prices! Easy Payments! Catalog dime. Zeppelin Arms, Akron, Ohio.

BOWS arrows, raw materials. Lowest prices. Lloyd Morrison, Waldport, Ore.

STAMP COLLECTING

STAMP outfit free! Scarce airmail triangle from Mozambique Col! Thrilling North Borneo (Jungle Scene)! Also World's largest ship stamp (picturing Columbus' Fleet) and fine packet other unusual stamps including Georgia (Dead Country!), Sudan (desert scene), a set of the world's smallest stamps—big lists and a watermark detector. All absolutely free to approval applicants sending 3c for postage. Write today. Midwood Stamp Co., Dept. 2R, Midwood Station, Brooklyn, N. Y.

BIG packet 105 all different including Alexandretta (new country), Congo, Epirus, Manchukuo, Ecuador constitution, Costa Rica triangle, air-mails commemoratives; giant diamond-shaped stamp, \$5 United States; set United States telegraphs, cataloging 30c. Packet British colonies including Burma (new country), jubilee and coronations; scarce Venezuela, cataloging 50c. Illustrated lists. Everything for only 5c to approval applicants! Write to-day! Mystic Stamp Co., Dept. 55, Camden, New York.

FREE—The Stamp Finder! Our new 20 page edition, fully illustrated, which will enable you to instantly identify all difficult stamps. Also fine packet of odd and unusual stamps from Bosnia-Herzegovina, Monaco, Patiala, Eritrea, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 918, Calais, Maine.

SUPER-WONDER packet offered containing 60 different stamps from Afghanistan, Transjordan, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc.; this entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Co., Box 87 (11), G.P.O. Brooklyn, N. Y.

BIG 5c offer! Consists of Ecuador (large commemorative), Chile, Jamaica, Costa Rica, Australia (Kangaroo), Cuba, Manchukuo, Indo-China, 10 different Peru, and 10 different Mexico. All for 5c to approval applicants. Maynard Sundman, D100, Bristol, Conn.

PRODIGIOUS Gift! Fantastic Indochina, German State, Savage Somalicoast, Perak, Selangor, Negri Sembilan, Bicolored Banana Airmail, Siberia. Absolutely free with Approvals! Postage 3c. Saxon Company, Dept. B, 408 Jay St., Brooklyn, N. Y.

AMAZING gift offer! Set Charkhari (odd Indian country). Set Montenegro (dead country). Set Boyking Yugoslavia. Stamps from 20 other countries, Kenya, Liberia, etc. Everything free to approval applicants sending 3c postage. Stamp Service, 77-C Webster Ave., Brooklyn, N. Y.

WORLD'S smallest airmail, free stamp magazine, \$2.00 U.S., animals, birds, Indian, airplane, commemoratives, scarce stamps 25 countries, 5c with approvals. Capital Stamps, Dept. SM, Little Rock, Ark.

WE'LL pay \$85.00 for 1924 1c green Franklin stamp, rotary perforated eleven, (\$1,000.00 if unused). Send 6c today for large illustrated folder showing amazing prices paid for old stamps and envelopes. Vernon Baker, 444-PS-12, Elyria, Ohio.

SOUNDS impossible! 120 different. Afghanistan, Azerbaijan, Zanzibar; triangle, diamond stamps; United States commemoratives, Civil War issue, \$2.00, \$5.00 high denominations; everything 5c! Abell's, 1818-H St. Paul, Baltimore, Md.

CAMEL Stamp and Airmail. Chance to join big Stamp Club, together with mammoth Stamp packet, 5c. Approvals. Atlas Stamp Company, 413 West 8th, Little Rock, Ark.

UNBELIEVABLE! 62 different: six triangles and diamonds; airmail, animal, war stamps. China, Japan, Manchukuo, insurgent Spain; Asia, Africa, South Seas. Everything, 5c! Crowder's, 127-H-E. North, Baltimore, Md.

FREE Stamp Catalogue. New Winter Issue. Giant fifty-page Quarterly, listing, Albums, Supplies, Coronations, Georgians, Canadians, United States and Foreign. Illustrations galore! Empire Stamp Company, Dept. PR., Toronto, Canada.

1897 GRANDE Comore, Kouangtcheouwan, Caymans, Liberian Bongo, Turks Caicos, huge Bhopal Triangle, etc. Everything 3c with approvals. Viking, 1-P Hanson Place, Brooklyn, N. Y.

SCARCE triangles, Afghanistan, St. Lucia, Vatican, Lebanon, over 100 different others, 10c with approvals. Nude Duchess, Spain 1930 Goya 1p, 5c with approvals. Laurence Shultes, Berne, N. Y.

DESIRABLE imperforate miniature sheet of four Triangular stamps—(extremely limited issue) with 50 different world collection, only 10c. Friendly Philatelists, Box 4428S, Philadelphia, Penna.

CONSTITUTION issue. Six different beautiful stamps, including Ecuador, Dominican and Guatemala, only 10c. Approvals. Starr Brothers, 4154 So. Vermont, Los Angeles, Calif.

SCARCE Swaziland, three Costa Rica Triangles, and others from unusual lands (no Europe) 5c only to those requesting our Quick Service Approvals. D. M. Ward, Desk S-2, Gary, Ind.

SPECIAL. 20 different commemoratives to applicants for my fine foreign approvals at 1c each and up. Postage 3c. Nels Dolve, 621-15th Avenue, Southeast, Minneapolis, Minn.

CZECHOSLOVAKIA (50); Germany (100); China (25); Japan (25); Spain (25); France (50). All different stamps. One country 10c; all 50c. Approvals if requested. Wollaston Stamps, Wollaston, Mass.

ECUADOR Constitution commemorative set. Richly colored, 5c. Approvals. Ruzika, 924-17th Ave., East, Cedar Rapids, Iowa.

DUPLICATES exchanged. Send 100 and dime. Receive 100 and only stamps White Russia ever issued, ten pictorials. S. Rose, 2855 Claflin Ave., New York, N. Y.

SPECIAL 3000 United States stamps, including precancels, airs, old issues, and commemoratives. All off paper, \$1.00, postpaid. Arnold Croll, Manitowoc, Wis.

HEADQUARTERS for United States. Send 50 cents for fifty different, including scarce 572 and 573. R. M. Stamp Co., Box 2308 Port Chester, N. Y.

U. S., Canada, Newfoundland, Mexico: "Four Star Approvals." Nothing like them! Write today. 312 mixed U.S. only, 10c. Kessels, Tucson, Ariz.

IVORY Coast girls, Diamonds, Triangles, Airmails, Commemoratives, 10c with numbered approvals. Cowan, 16152 Snowden, Detroit.

500 DIFFERENT, \$1.00. Desirable material. Approvals against reference. Washburn & Sons, 192 Maple, New Britain, Conn.

FIJI Borneo, 23 other British colonial 3c. Approvals. Porter, Box 863, Springfield, Ohio.

EARN cash, stamps. Sell my approvals—nickel packets. Elliston, 2841 W. 37th St., Brooklyn, N. Y.

75 DIFFERENT United States 35c, 100, 50c. Pillault, 528 Broadway, Oakland, Calif.

CANADA. 30 different including pictorials. Only 5c to approval applicants. "Crescent Stamps," London, Canada.

FREE! Two coronation sets. Postage 3c. Roberts, 312U Shearerbldg., Baycity, Mich.

200 COMMEMORATIVE and obsolete United States postage (over 75 different), \$1.00. Waldo, Box 268, Dallas, Texas.

UNPICKED! 100 U. S. revenues on documents, 10c! (1,000—60c). Vanvoorheis, Hyndman, Pa.

500,000 STAMPS! General line approvals. Where? Peterson's, Box 300, St. Paul, Minn.

100 DIFFERENT, 5c with 1c Approvals. Hacker, 305 Willie, Birmingham, Ala.

PENNY Approvals that please. Haywood, 395 Adams Street, Pomona, Calif.

BEST one cent approvals in America. Elvin Stanton, Niantic, Conn.

wood, Colorado.

1,000 MIXED foreign, 25c. Well worth sorting for value. Plaza Stamp Co., Box 1161a, Santa Fe, N. Mex.

18 DIFFERENT United States commemoratives, 10c with foreign approvals. Goldsmith, Box 200, Chicago.

FREE. 25 different. United States. 3c. please. Schultze, Box 55a, Woodhaven, N. Y.

1000 DIFFERENT All World Catalog \$27.00 for \$1.00. French, 241 Euclid, Cleveland, Ohio.

200 DIFFERENT world 10c. approvals. Hazett Stamp Shop, 701s Fourth, Bay-city, Mich.

FREE. Packet to approval applicants. Schramm, 1489 East 19th Street, Brooklyn, N. Y.

U.S. Packet or your choice from foreign approvals included. Postage please. Wm. Clatworthy, Upland, Calif.

FREE: 50 stamps, Iraq, etc. Postage 1c. album 3c. Bullard, 268D Northampton, Boston, Mass.

FASCINATING foreign approval selections! Lowest prices! Rosenberg, 3527 West Adams, Chicago.

BRITISH Colonies included. Forty country mixture, 100 stamps, 10c; 300, 25c. No approvals. Elzea, Bowling Green, Ohio.

LIBERIA snake triangle, giant Spanish triangle. 50 other stamps, 5c. Wright Co., 2527-H, Guilford, Baltimore, Md.

AF 1/10 catalog—U.S. & British Colonies. Meyerowitz, 1756R-70 St., Brooklyn, N. Y.

150 U. S. Commemoratives, etc., 25c; 500, 55c. U. S. approvals if desired. A. Grove, 306c Blanchard, Seattle, Wash.

BY Country, foreign approvals. Zimmer, 722 Culver Road, Rochester, N. Y.

EXCHANGE duplicates new way. Particulars free. Gage, Arcade, Pasadena, Calif.

O ER 500 mixed stamps, 25c. Reitter-Imhoff, 111 Jackson, Chicago.

UNITED States mixture, 35c, 1000. R. Schiffermuller, Bellerose, N. Y.

PACKET Roumania, dime with approvals. Notro, 4909 No. Seeley, Chicago.

STAMPS: for your collection, assortment 10c. Mobley, Box 3176, Hollywood, Calif.

35 AIRMAILS, commemoratives, etc., 3c. Altone, 2068 Daly, Bronx, N. Y.

200 DIFFERENT foreign stamps, 10c. Monjar, 1542 Waverly, Cincinnati, Ohio.

TATTOOING SUPPLIES

TATTOOING outfits, supplies. Illustrated list free. "Waters," 965 Putnam, Detroit.

TAXIDERMISTRY

LEARN by mail to mount birds, animals, fish, game heads. Tan skins, make leather, all in one easy course. Old reliable school, founded 1903, over 250,000 students. Rush postal for Free 48 page book, tells all about it. Very low tuition fee right now. Address Northwestern School of Taxidermy, 339 Elwood Bldg., Omaha, Nebr.

FREE. 32-page catalog. New ideas. Bargains galore. Everything for every specimen. Taxidermic Manufacturers, Memphis, Tenn.

GLASS eyes, taxidermists' furriers' supplies. Big catalog free. Elwood Company, 228 Smith Bldg., Omaha, Nebr.

"MODERN Taxidermist Magazine," Greenfield Center, N. Y. Three sample copies, 25c.

TYPEWRITERS

NEW vest pocket adding machine. All steel. Chromium plated. Addition, subtraction, multiplication. Eight columns, \$2.50. Illustrated catalog. Slide rules, engineers instruments, 10c. Refunded first order. Agents wanted. Tavella, 33 W. Broadway, New York.

day. Nationally advertised typewriters, adding machines. Rockaway Typewriter Co., 10 St., Far Rockaway, N. Y.

WANTED--MISCELLANEOUS

CASH for used microscopes, binoculars, cameras, slide rules, drawing instruments, mechanical, scientific and instruments. Highest prices paid day payment received. Satisfaction guaranteed. Shipment promptly returned. Elmer, 2300-PS VanBuren, Chicago.

WELDING, SOLDERING

D.C. ARC-WELDER plans \$1.00 each. (Positively no armature winding) Design: 25-200 amperes from 32 volt De farm light plant. Heavy Duty plan: 25-200 amperes from d.c. truck motors. Design: 25-200 amperes from North-east (Dodge) 12 volt automobile generator. Welders Club of America, WB-3432 1st Mart, Chicago. Special: D.C. truck motor new and used, for sale.

BUILD Your Own, 110-220 V. AC. Welder for less than \$5.00 from Automobile Generator Coils. No rewinding. Easily handled. 1/2" Rods. Full power control. Plans, \$1.00. Information and price list of rods, 10c. Welders Supply Co., Box 132, Bellefontaine, Ohio.

75-200 AMPERE arc welders from Dodge generators. Complete plans, 35c. 100 other generator changes. LeJay Manufacturing, 323 LeJay Bldg., Minneapolis, Minn.

DEMONSTRATORS, electric arc welders. Money saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, Box P-1283, Troy, Ohio.

WIND ELECTRIC PLANTS

BUILD wind light plant. Complete plans and valuable catalog 10c. Welders, electric fences. LeJay Manufacturing, 423 LeJay Bldg., Minneapolis, Minn.

NEW book shows how to make any shirt model. Short cuts, kinks, plans, 100 illustrations, only \$1.00 postpaid. Eugene Watson, Dept. C-128, 353-4th Ave., New York.

MAKE REAL MONEY

Get Into

ADVERTISING

LEARN AT HOME

Send for FREE Book

Field is uncrowded. Big opportunities await lots of men and women. Our modern home-study course trains you quickly. No special educational requirements. You learn by doing actual work, under leading Ad men. No textbooks. Low tuition fee, easy to pay. Money back if not satisfied. Your 1 cent postcard brings FREE ILLUSTRATED BOOK. Send today. No obligation. Start learning at once!

ADVERTISING INSTITUTE OF AMERICA

100-5th Av. Dept. F-3, New York City

AGENTS UP TO \$50 IN A WEEK

Big cash profits for you; full or spare time. Over 250 household necessities—things people must buy. Proven fast sellers; steady repeaters. Earnings very first day. FORD TUDOR SEDAN GIVEN YOU AS BONUS. I'll show you how to start at once; send you everything—Big Display Outfit and quick cash plans. Details FREE—no obligation. Just send name on postcard.

ALBERT MILLS, 6596 Monmouth Ave., Cincinnati, O.



LIVE BODIES FOR SALE

Oh boy! Wouldn't that be swell—I'll tell you what I will do though. I will take that scrawny body of yours and whip it into shape just like I have done for myself and so many others. Do you want big muscles and a huge robust body? My book "Pulsant Body Building" is absolutely FREE.

TOMMY LOUGHRAN
Undeclared World Champion

TOMMY LOUGHRAN
Dept. 91, 45, 15th Street, Philadelphia, Pa.

Name.....

Street.....

City..... State.....

FREE

"Pulsant Body Building"

Sign here →

Postal card will do.

QUICK CASH IN NEW POTATO CHIPS

START AT HOME

Here's your chance—a money-making business of your own. Turn potatoes into cash by making new kind of Potato Chips with my improved outfit. Makes delicious, superior, "NON-GREASY" Chips at low cost. A few hours' practice does it. Begin anywhere—city, village, town. Potatoes cheap and plentiful. Wholesale or retail. Steady year 'round business. Groceries, markets, restaurants, taverns, do the retailing for you. **WE HELP START YOU IN BUSINESS** Great quantities of Chips are eaten daily. Profit large—unusually so. You can start this money-making business on a "next to nothing" outlay of cash. Write for Potato Chip Booklet.

Long-Eakins Company
1247-S High St. Springfield, Ohio




BIG MONEY from POULTRY

I show you how to increase profits, or start your own business. I train you at home in spare time. I show latest methods. Give you full details. That can be worth money to you, or to an employer already established in some branch of the poultry business. Men and women in small towns or suburbs will be particularly interested because latest scientific methods may mean extra profits for them. My home study course used by thousands. 32-page book "How to Raise Poultry for Profit" comes to you FREE. Coupon today.

SCIENTIFIC POULTRY RAISING


HARRY M. LAMON, Pres., National Poultry Institute,
Dept. 203-E, Adams Center, New York

Please send me your FREE Book about poultry raising, and facts about your country.

Name.....

Address.....

City (R.F.D.)..... State.....



ELECTRICITY IN 12 WEEKS IN THE COYNE SHOPS

PAY TUITION AFTER GRADUATION

Mail coupon today for details of my "Pay after graduation plan" and famous Coyne "Learn by Doing" method of practical shop training for your start for success in this big-pay field. Age or lack of money need not hold you back. Get training first; then take 18 months to complete small monthly tuition payments starting 5 Months after you begin training.

12 WEEKS' TRAINING

Coyne Training is practical, thorough, easy to grasp . . . you learn quickly by doing actual jobs on real electrical machinery right here in my Chicago Training Shops - NOT from books or printed lessons. You don't need previous experience or a lot of book learning. Expert instructors guide you every step of the way.

EARN WHILE LEARNING - JOB HELP AFTER GRADUATION

Big things ahead in Electricity means opportunities for steady jobs, good pay, and a real future in this fascinating "live" industry. Thousands of opportunities. Rush the coupon TODAY for Big Free Book containing many photos of the great Coyne Shops in Chicago, facts about Coyne Training . . . Free Employment Service . . . many earn while learning . . . additional instruction in Diesel Engines, Electric Refrigeration and Air-Conditioning at NO EXTRA COST and amazing Pay-Tuition-After-Graduation Offer.

COYNE ELECTRICAL SCHOOL
H. C. LEWIS, President
500 S. Paulina St., Dept. 98-73, Chicago, Ill.

H. C. LEWIS, President, Coyne Electrical School
500 S. Paulina St., Dept. 98-73, Chicago, Ill.

Send me, without cost or obligation, your Big Free Book and details of Pay-Tuition-After-Graduation-Offer.

NAME _____

ADDRESS _____

CITY _____ STATE _____

Learn
by
Doing

There's MONEY IN ARC WELDING!

"No more tiresome work for me. I get a real thrill out of being an arc welder—and don't forget it, I'm getting more money than I ever earned on hit or miss jobs. You, too, can become part of this great new industry! There's almost no limit to what welders can accomplish—they cut manufacturing costs way down. Because they know "How and Why" of Welding, Metallurgy, Drawing, Blueprint Reading, Set-Up Work and Fabrication. No wonder manufacturers all over the country are depending practically trained School of Engineering Welding Operators, Welding Technicians, and Welding Engineers! Don't be content with ordinary work at low pay—when a short time you can become a thoroughly Trained Specialist in Welding.

MILWAUKEE SCHOOL of ENGINEERING Institute of Electrotechnics

PS-1238A Broadway and E. State, Milwaukee, Wis.

Send Free Booklet "ARC WELDING, World-Wide Dawn of a Gigantic Industry." Also tell me how I can become an

arc Welding Operator in 3½ months....Gas Welding Operator (6 weeks)....

Welding Technician (4 months).....Welding Engineer (1 year).....

Send details of Student Loan Plan.....Earn Part Expense Plan.....

Name..... Age.....

City..... State.....

If interested in other courses check here Refrigeration and Air Conditioning

Technician (3 mo.)..... Radio and Television Service Man (6 mo.).....

Commercial Radio Engineer (1 yr.)..... Electrical Engineer B.S. Degree

(4 yrs.)..... PS-1238A

Please mention POPULAR SCIENCE when writing to advertisers.

Every mechanical movement and design known to man is illustrated in the ENGINEER'S SKETCHBOOK

Here's a gold mine of practical information that will solve many of your everyday mechanical problems, and inspire you with new ideas. Every conceivable mechanical movement, device, appliance and detail used in designing and constructing is accurately and simply described—gears, valves, bearings, engines, couplings, boilers, and thousands of other subjects. There are 2,987 actual working drawings and diagrams! Easy to understand and apply. It will save you time, worry, and money! Send only \$4.25, and the SKETCHBOOK will be sent postage paid. Money back if not satisfied.

CHEMICAL PUBLISHING COMPANY OF NEW YORK
148 Lafayette Street (Dept. 10) New York City

WE CAN TEACH YOU TO MOUNT BIRDS

Squirrel
Lighter



ANIMALS, HEADS, FISH

Also to tan skins and FURS. Easily learned AT HOME BY MAIL. Wild game growing scarcer—big demand. Be a taxidermist. Mount for others.

Big Fun. Real Hobby. Mount common specimens—no wild game needed. REAL PROFITS IN SPARE TIME.

FREE BOOK

Men, Boys, get wonderful FREE BOOK—tells how YOU can learn this fine art quickly. Investigate. Send this minute. State AGE. N.W. School of Taxidermy, 3399 OMAHA, NEB.



WELDERS WANTED!



ELECTRIC ARC—OXY-ACETYLENE
Skilled Welders earn \$8 to \$15 a day. The demand now greater than the supply. Learn this highly paid trade in 4 weeks by actual shop work. One of America's leading schools. Established 1902. 7 floors of shops. Endorsed by welding industry. Limited number of students. 4 weeks course in Electric Arc or Acetylene Welding, including room and board, only \$159. Write or wire for reservation. Ask for "Welding Facts," State age.

GREER COLLEGE, Dept. 3128, 2024 S. Wabash Ave., Chicago

NEW MILEAGE RECORDS WITH

VACU-MATIC—The Carburetor That Breathes

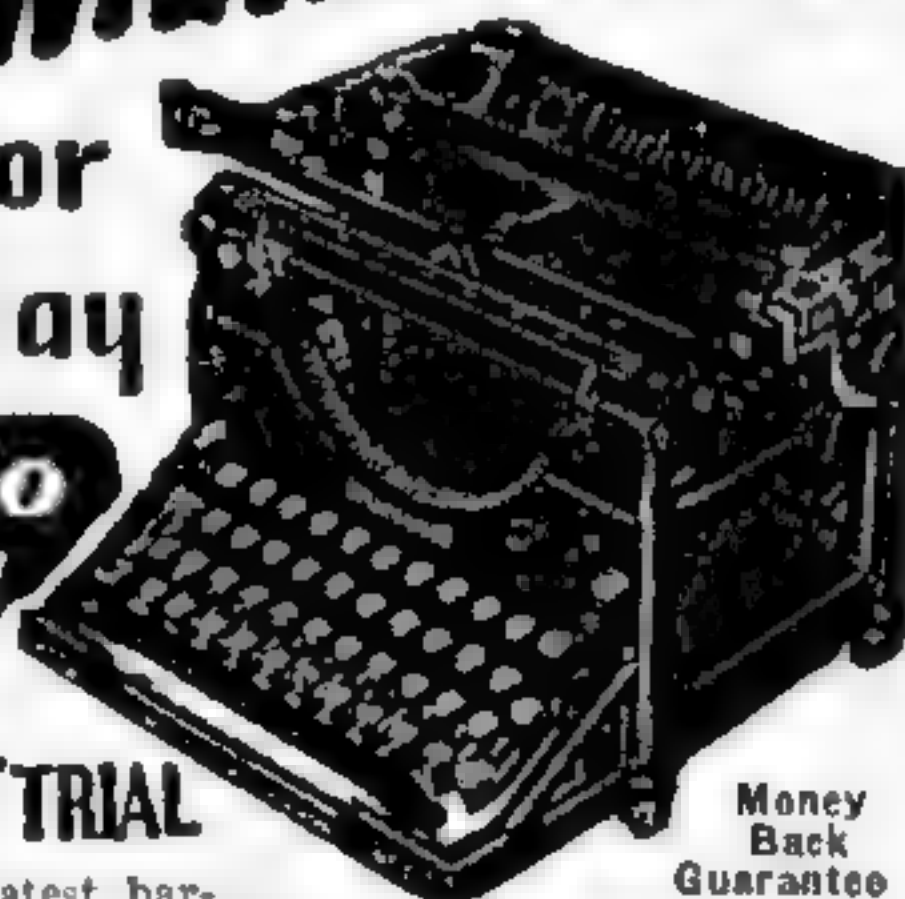
AGENTS: Write now for free sample offer regarding Vacu-matic motor device. Automatic control. Wonderful demonstrator. Just what car owners are looking for. Saves up to 30% on gasoline. More power, smoother running, quicker starting. Write today to VACU-MATIC CO., 7817-400 W. State St., Wauwatosa, Wis.

TYPEWRITER ½ Price

Yours for
10¢ a Day

Send No
Money

Sent on
10 DAY FREE TRIAL



Money
Back
Guarantee

Positively the greatest bargain ever offered. A genuine full sized \$102.50 office model refinished Underwood No. 5 for only \$44.90 (cash) or on easy terms. Has up-to-date improvements including standard 4-row keyboard, back-spacer, automatic ribbon reverse, shiftlock key, 2-color ribbon, etc. The perfect all purpose typewriter. Completely rebuilt and FULLY GUARANTEED.

INTERNATIONAL TYPEWRITER EXCHANGE

231 West Monroe St., Chicago, Ill., Dept. 1207

Send Underwood No. 5 (P.O.B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect. If I keep it I will pay \$3.00 a month until I have paid \$49.90 (term price) in full. For quick shipment give reference and occupation.

Name..... Age.....

Address.....

Town..... State.....

LANGUAGES Made *easy* By LINGUAPHONE

This amazing new Method enables you, in your own home, to speak and read any of 23 foreign languages in an incredibly short time. Endorsed by leading university professors and thousands of men and women as the quickest, simplest and most thorough language method. Send for catalogue and FREE Trial Offer.

LINGUAPHONE INSTITUTE
22-A Rockefeller Center New York City

MECHANICS-WELDERS - COLLISION MEN

Good pay jobs for trained men in Auto and Diesel Mechanics, Electric Arc and Acetylene Welding. Complete courses. Practical training. Short courses in body and fender bumping, spray painting, metal finishing. Fine equipment. Special low rates. Pay-after-graduation-plan. Write today.

Michigan Trade School
3761 Woodward Ave. Detroit, Mich.

**Write for
FREE
FOLDER**

ELECTRICAL ENGINEERING

ONE YEAR condensed course prepares for technical work in the electrical field. Thorough training in principles, with practical applications in laboratory and shop. High placement record. Modern buildings, dormitory, dining hall. Campus. 46th year begins Sept. 28. Catalog on request.

BLISS ELECTRICAL SCHOOL
112 Takoma Ave.
Washington, D. C.



PREPARE FOR TOMORROW'S OPPORTUNITY

This is your opportunity to qualify as a Diesel Engineer. Men with practical training are in demand for good-paying, responsible positions. You can qualify for a place in this rapidly growing industry.

TESTED TRAINING—REAL SHOP EXPERIENCE
Internal Combustion Engines—Automotive Service
National Schools give you actual shop methods. You learn on the latest and best equipment in a million-dollar trade school. You are taught to make good and helped to make good after you graduate. It will pay you to investigate National's Master Course.

FREE!

Transportation Allowed to Los Angeles
Coach railroad fare allowed from any point in the United States.

Earn room and board while learning. Graduate employment cooperation.
Mail coupon for new 40-page Book of Diesel Facts, details of training, employment opportunities.



**NATIONAL
SCHOOLS
LOS ANGELES**

Request for FREE BOOK

NATIONAL SCHOOLS
Dept. PS-12, 4000 So. Figueroa St., Los Angeles, Calif.

NAME _____ AGE _____

ADDRESS _____

CITY _____ STATE _____



High School Course at Home

Many Finish in 2 Years

You can complete this simplified High School Course as rapidly as your time and abilities permit. Equivalent to resident school work—prepares you for entrance to college. Standard H. S. texts supplied—Diploma. Credit for H. S. subjects already completed. Single subjects if desired. High School education is very important for advancement in business and industry and socially.

College Entrance

During the past 14 years, our High School graduates have been admitted to 531 different Universities, Colleges, Junior Colleges and Normal Schools—80% of them without entrance examination. Course also prepares for teachers' certificate and pre-professional examinations.

Business—Industry

To get and hold a good position in Business today you must be able to write clear, accurate letters and reports—do figuring involving Algebra and Geometry—talk intelligently on matters requiring a knowledge of Geography, History, and Economics.

In Industry—Mechanical and Engineering lines—you must have at least an elementary knowledge of Physics and Chemistry—be able to figure quickly and accurately—know something of Mechanical Drawing and blueprints—and be able to talk and write accurately and clearly on both your work and ordinary topics of conversation.

Our High School course meets the preparatory educational requirements for Business and Industry.

An Educational Institution

The American School was chartered in 1897 as an educational institution, not for profit—and is exempt from paying Federal income tax, like the best resident colleges and universities.

Don't Be Handicapped— Complete Your Training Now

Be a High School Graduate! Prepare yourself for promotion in Business and Industry—for the Professions, College Entrance and social success. No matter what line you may select, High School training will prove invaluable to you! Our moderate fees cover all instruction, standard textbooks and Diploma. Easy monthly terms. Get ahead in life. Start your training NOW!

20 Other Courses

Over 150 noted Educators, Engineers, and Business Men helped prepare our special instruction material, which is used by many resident schools and colleges, U. S. Navy, and Provinces of Manitoba, Canada. We offer you quality training at home for the best-paying lines of Industry and Business, as listed in the coupon.

Mail coupon for information about line that interests you
American School, Drexel at 58th, Chicago

American School, Dept. H-946, Drexel at 58th, Chicago
Tell me how to train for success in line checked. No obligation.

- | | |
|--|--|
| <input type="checkbox"/> High School Course | <input type="checkbox"/> Diesel Engineering |
| <input type="checkbox"/> Accounting & Auditing | <input type="checkbox"/> Drafting & Design |
| <input type="checkbox"/> Architecture & B'ldg | <input type="checkbox"/> Liberal Arts |
| <input type="checkbox"/> Automotive Engin'g | <input type="checkbox"/> Private Secretary |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Hi'er Ac't'g (C.P.A.) |
| <input type="checkbox"/> Commercial Aeronautics | <input type="checkbox"/> Highway Engin'g |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Mechanical Eng'g |
| <input type="checkbox"/> Electrical Refrigerat'n | <input type="checkbox"/> Radio & Television |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> Steam Engineering |
| <input type="checkbox"/> Complete Law | |

Name _____

Address _____

I'll Train You in DRAFTING until You Get a GOOD PAY JOB



Get practical training. Take up Drafting—because it gives you bigger, better chance to get into your favorite field—Electricity, Aviation, Diesel, Air Conditioning, Automotive, Building, Machinery, Transportation, etc. Remember, everything built has its birth on the Draftsman's Table.

**GET MY
PROVEN
PAY
RAISING
PLAN**



Draftsmen Draw Good Pay
I have trained thousands of men aged 16 to past 50 in their spare time at home, to qualify for Bigger Jobs at Better Pay. Let me train you in a short time by same easy, low cost practical method. No experience needed. High School education not necessary.

All Working Tools Furnished
You get complete Professional Draftsman's Tools and Drawing Table—sent without extra charge at once. Mail coupon for Free Book about my PROVEN PAY RAISING PLAN. Write TODAY!

ENGINEER DOBE, Div. 3399, Libertyville, Illinois

ENGINEER DOBE, Div. 3399, Libertyville, Ill.

Send me your Free Book "SUCCESSFUL DRAFTSMANSHIP." Explain how you assist your graduates to good positions as Draftsmen.

NAME.....AGE.....

ADDRESS.....

TOWN.....STATE.....

FREE BARGAIN CATALOG of BOOKS

25,000 books of all publishers listed in our 44th Annual Bargain Catalog of 320 pages. Old-time favorites—latest "best sellers." Reference, Fiction, Juvenile, History, Scientific, etc. Supplying schools, colleges, libraries and thousands of individual customers. Send postcard today for our new 1939 catalog, "Bargains in Books." **THE BOOK SUPPLY COMPANY, Dept. 147**
564-566 West Monroe St., Chicago, Ill.

INVENTORS PATENT YOUR IDEAS SEND FOR FREE BOOK

HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U.S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form.

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

Woolworth Bldg., 35th Floor, Dept. 128C, New York City
MILLER BUILDING, Dept. 128C, Washington, D. C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME.....

ADDRESS.....

1,500 NEEDED INVENTIONS

LATEST EDITION of this remarkable source book for inventors by R. F. Yates tells what inventions manufacturers are seeking what will pay most money. Also gives new scientific discoveries important to inventors. Final as yet to working inventions that pay. Simple practical ideas. Large cloth bound book, 200 pages. Don't waste time. Send \$1.00 today or send \$1.00 for this great book and **INVENTORS' SELLING GUIDE** which tells you where and how to safely your patented or unpatented inventions to its list of nearly 1000 buyers. Everything you must know about Selling Methods, Law, Royalty Contracts, Financing, Finders Fees, etc. 200 pages. Cloth \$2.00. Money back guaranteed.

FREE Write for free "Protecting and Selling Inventions" booklet. Money back guaranteed. Send \$1.00 for this booklet. **WRITE FOR FREE CATALOG** of valuable books for inventors. **DONLEY PUBL. CO., 509 Fifth Ave., Dept. S 12, New York, N. Y.**

PATENTS—TRADE MARKS

All cases submitted given personal attention. Form "Evidence of Conception" with instructions for use and "Schedule of Government and Attorneys' Fees"—FREE!

LANCASTER, ALLWINE & ROMMEL
(Patent Law Offices)
413 Bowen Bldg. Washington, D. C.

New Ideas now Salable Before Patenting

Practical, useful inventions may now be safely marketed without patenting expense. Write for proof that we have been successfully selling both patented and unpatented inventions, since 1924.

Chartered Institute of American Inventors
Dept. 3, Barrister Building Washington, D. C.

PATENTS PERSONAL SERVICE

My Personal service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and \$5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 340-D Victor Bldg., Washington, D.C.

ALBERT E. DIETERICH
THEODORE H. RUTLEY
REGISTERED PATENT LAWYERS
512-A Colorado Bldg. WASHINGTON, D. C.
Booklet on Patents sent free

Inventions Promoted

Patented or Unpatented. In business over 30 years. Send drawing and description or model, or write for information. Complete facilities. References.

ADAM FISHER COMPANY
183-D Enright, St. Louis, Mo.

PLASTEX

The Plastic Industry needs manufacturers on small scale and for the production of Laminated and Cork Goods, Art Goods & Novelties in Plastic and Marble imitation. Experience unnecessary. No material above rest of the store shelves. Rubber moulds furnished for speed production. Small investment brings big results. Ambitions men have chance for real prosperity. Our free booklet will interest and benefit you.

PLASTEX INDUSTRIES, Dept. 2
1085 Washington Avenue New York, N.Y.



BE A CAMERA REPORTER

MAKE YOUR CAMERA BRING YOU A CASH INCOME. Interesting, Easy-to-Learn, Spare Time Course Prepares You For Exciting Profession. Earn Money While You Study! Camera Reporting, Picture shooting, for scores of newspapers and magazines. A high paying profession that any man or woman can enter! **YOU NEED NO EXPERIENCE.** You learn by doing. Tasope' trains you for a good job, or you can work for yourself. Most modern practices, including natural color photography! All popular cameras. Low Cost—Easy Payment Plan. Write for Beautiful Free 32-Page Photo-Illus. Book.

NO EXTRA CHARGE for a short course in Photography when taken with our PHOTO-ENGRAVING COURSE.

TASOPE' SCHOOL OF MODERN PHOTOGRAPHY, Dept. 10LS Aurora, Mo.



TRI-STATE COLLEGE

B-S-Degree in 2 years

World famous for technical 2-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering, Business Administration and Accounting.

Those who lack high school may make up work. Short diploma courses (36 weeks) in Surveying, Drafting. Low tuition. Low living costs. Students from every state and many foreign countries. 55th year. Enter January, March, June, September. Write for catalog, 5128 College Ave., ANGOLA, IND.

INVENTORS PROTECT & SELL

Your unpatented invention can be sold with positive safeguards under patent laws. New, low-cost procedure. Complete details, free.

AMERICAN PATENTS CORPORATION
Dept. 3-E Washington, D. C.

MAKE MONEY

AT HOME!

Learn to color photos and miniatures in oil. No previous experience needed. Good demand. Send for free booklet, "Make Money at Home" and requirements.

NATIONAL ART SCHOOL
3601 Michigan Ave., Dept. 1369, Chicago

Operator No. 38



FOLLOW THIS MAN

Secret Service Operator No. 28 is on the job! Running down dangerous Counterfeit Gang. Tell-tale finger prints in murdered girl's room.

Free

The Confidential Report Operator No. 28 made to his chief. Write for it.

Earn a Regular Monthly Salary

YOU can become a Finger Print Expert at home, in your spare time, at small cost. Write for confidential full report and details. Literature will be sent only to persons stating their age.

INSTITUTE OF APPLIED SCIENCE

1920 Sunnyside Ave. Dept. 1369 Chicago, Ill.

WANTED—MEN

to cast Christmas Goods, 5 and 10c Novelties, Toy Autos, Ashtrays, etc. Can be done in any spare room, basement or garage and no experience necessary. A rare opportunity to devote spare or full time to profitable work. **WRITE DEPT. E.**

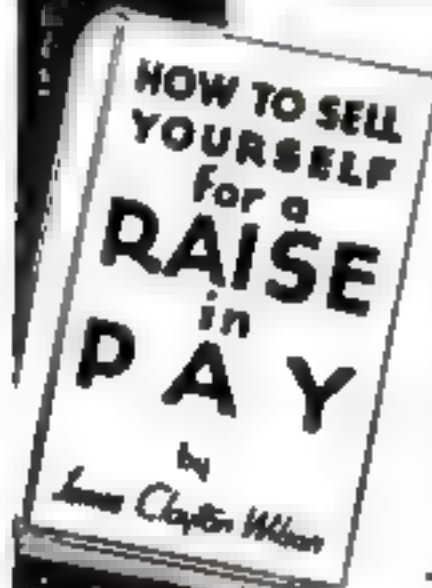
METAL CAST PRODUCTS CO.

1696 Boston Road

New York City

HOW TO GET A RAISE IN PAY

Read this Book to Earn More Money



Most helpful book ever written. Self-analysis chart at end of each chapter. 38 chapters, any one worth the price. James Clayton Wilson, author. \$1.00 postpaid. 10c postage extra C.O.D. orders. Canada \$1.20 duty paid. 5 days proof this book will help you or money refunded.

DOLLAR PUBLICATIONS

737 North Michigan Ave., Chicago

\$1

I want to get ahead. Send me your new book. \$1 attached.

Name.....

Address.....

City and State.....

Inventors Free Books



Answer your questions!

Practical Facts You Will Want to Know About

PATENTS

TRADE MARKS
COPYRIGHTS

● **These C. A. Snow & Co. Free Books will save you TIME and MONEY!**

Now one of America's oldest firms of patent attorneys offers you important facts on how to protect and commercialize your ideas...the very facts which can save you wasted hours and unnecessary expense. These free books are based on 63 years' experience and tell you exactly what to do to protect your invention.

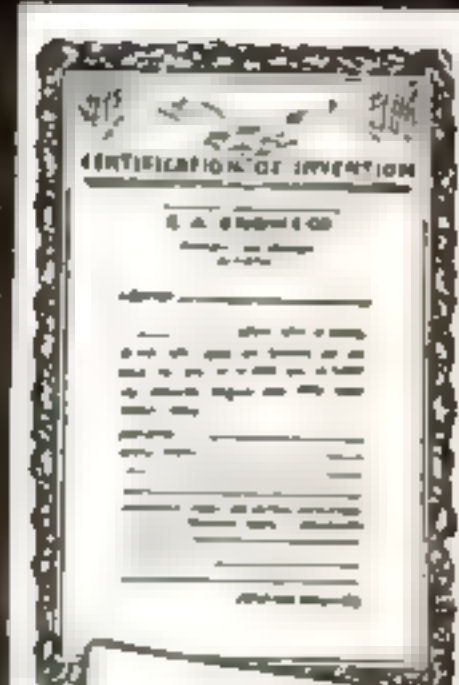
Find Out RIGHT NOW

Before going any further with your idea—be sure you are on the "right track". You will be able to know *before* spending more time and money the costs and procedure in obtaining a patent. In the books you will find the plain answers to questions that have long bothered inventors.

Confidential, quick service

Our years of experience in helping others should make you feel perfectly safe in dealing with this reputable firm. All inquiries are answered immediately and held in strictest confidence. Write today.

TEAR OUT and Mail Coupon Today



C. A. SNOW & CO.

Registered Patent Attorneys Since 1875

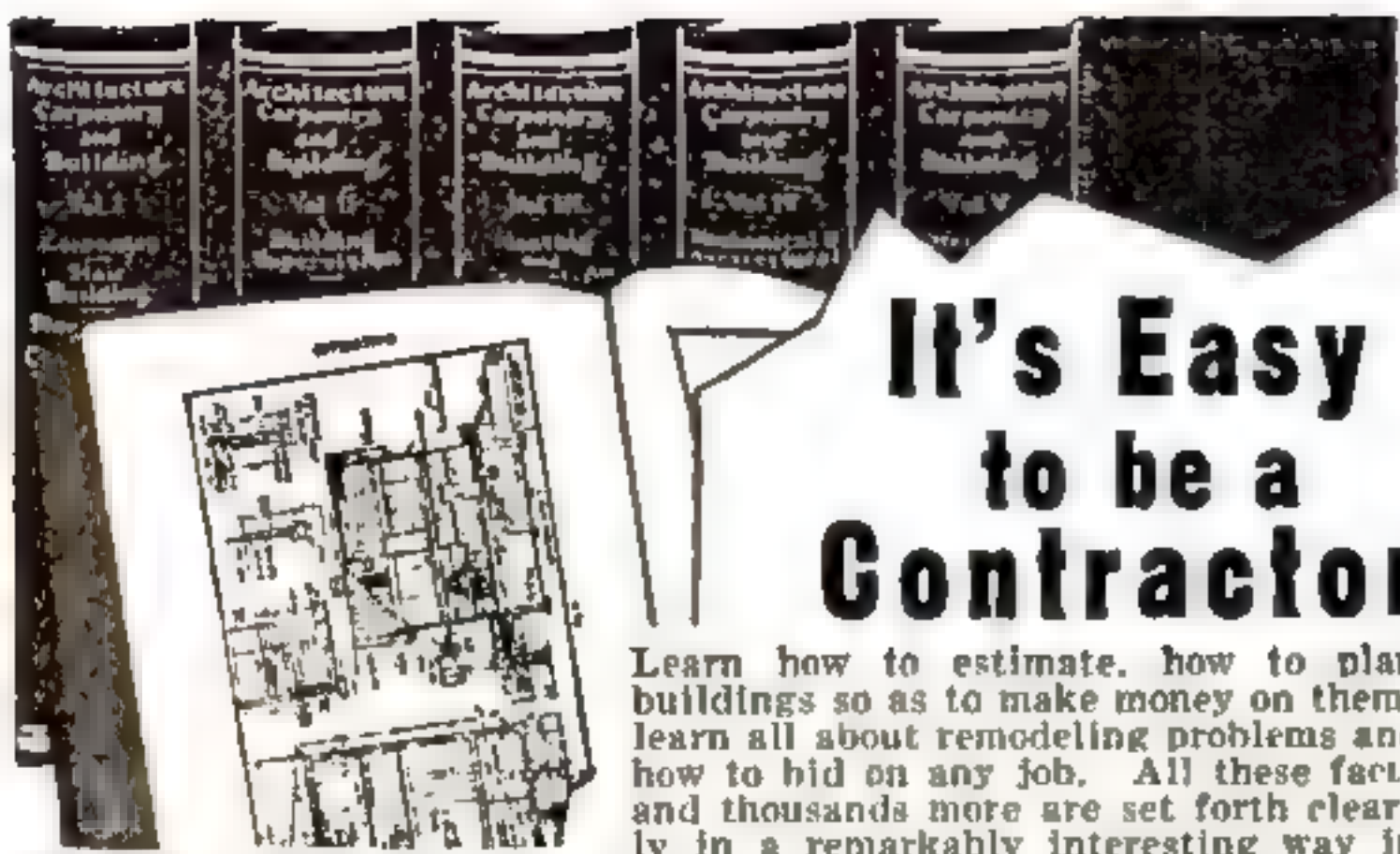
2128 SNOW BUILDING, WASHINGTON, D.C.

Gentlemen: Please send me—without cost or obligation—your **FREE** books, "Suggestions on How to Commercialize Your Invention" and "How We Protect You." Also Certification of Invention form.

Name.....

Street and No.

City or Town..... State.....



It's Easy to be a Contractor

Learn how to estimate, how to plan buildings so as to make money on them, learn all about remodeling problems and how to bid on any job. All these facts and thousands more are set forth clearly in a remarkably interesting way in these five wonderful books covering all phases of Architecture, Carpentry and Building. These books are complete and the new JIFFY INDEX makes it possible to find anything you want to know about building in a few seconds.

these five wonderful books covering all phases of Architecture, Carpentry and Building. These books are complete and the new JIFFY INDEX makes it possible to find anything you want to know about building in a few seconds.

"Boss" Carpenters in Demand

New public works jobs—immense projects all over the country are requiring men who can "Boss the Job"—Men who know how. These books give you "QUICK" training. With them you don't have to be afraid to tackle any job for you can find needed facts in a hurry. If you send now we will include without extra cost a big 120 page book "Blue Print Reading." IN ADDITION TO THE FIVE BIG BOOKS.

Coupon Brings Books FREE for Examination

American Technical Society, Dept. G920
Drexel at 58th St., Chicago, Ill.

You may ship the five big books on Architecture, Carpentry and Building, include book on blue print reading. I will pay the few cents delivery charges only and if I am fully satisfied after 10 days I will send you \$2. After that only \$3.00 a month until the total reduced price of only \$19.80 (former price \$24.80) is paid. I am not obligated in any way unless I keep the books.

Name

Address

Employer's Name

Please attach a letter giving age, occupation and the name and address of your employer and that of at least one business man as reference.

How To Secure A Government Position

Why worry about strikes, layoffs, hard times? Train now for a Government job. Increased salaries, steady work, travel, good pay. Let us help you become a Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—help you get a position in Government Classified Service. I was a Civil Service Examiner for nearly 8 years. This coaching has helped thousands. Big illustrated book tells about Government jobs—and how our instruction helps to qualify you to get the one you want. Send for a free copy TODAY.

FREE BOOK

helps to qualify you to get the one you want. Send for a free copy TODAY.

PATTERSON SCHOOL, Arthur R. Patterson, (Former Gov't. Examiner) Principal, 1612 Mercantile Bldg., Rochester, N. Y.
Send without obligation, free book "How to Secure a Government Position."

Name

Address

New Catalog

—OF BARGAINS IN MILITARY, Outdoor and Sport Goods, Clothes, Shoes, Boots, Blankets, Tents, Firearms, Boy Scout Supplies, etc. Send 10c for copy to be redeemed on first order.

A AND N SUPPLY CO.
Formerly Army & Navy Supply Co.
4784 Lester St., Richmond, Va. EST. 1868

Regain Perfect Speech, if you

STAMMER

Send today for beautifully illustrated book entitled "DON'T STAMMER," which describes the Bogue Unit Method for the scientific correction of stammering and stuttering. Method successfully used at Bogue Institute for 37 years—since 1901. Endorsed by physicians. Full information concerning correction of stammering sent free. No obligation. Benjamin N. Bogue, Dept. 952 Circle Tower, Indianapolis, Indiana.

EASY TO PLAY —EASY TO OWN



• You've always wanted to play this fascinating instrument. Now there is no reason to delay. Now you may thrill family and friends—with a chance to earn extra cash at dances, entertainments and on the radio. For now there is a genuine DEAGAN Marimba (including complete, easy lessons) at the lowest price in history . . . To write for details TODAY may easily mean a LIFETIME of pleasure, profit and popularity!

J. C. DEAGAN, Inc., 2659 Deagan Building, CHICAGO

ANY BOOK IN PRINT!



Delivered at your door. We pay postage. Standard authors, new books, popular editions, fiction, reference, medical, mechanical, children's books, etc.—all at guaranteed savings. Send card now for Clarkson's 1939 Catalog.

FREE Write for our great illustrated book catalog. A short course in literature. The buying guide of 300,000 book lovers. The answer to your Christmas gift problem. FREE if you write NOW—TODAY!

CLARKSON PUBLISHING COMPANY
Dept. PS—1255 So. Wabash Ave., Chicago, Illinois

RETIRE IN 15 YEARS

You can retire at age 55, 60, 65 or 70 on an income of \$10 to \$200 a month. Yet you don't have to be rich—over 38,000 people use our simple Retirement Income Plan. Send for important free booklet. Phoenix Mutual Life Insurance Co., 309 Elm St., Hartford, Conn.



AGENTS 300% Profit GOLD LETTERS

For Store Fronts and Office Windows. Anyone can put them on. Free samples. Liberal Offer to general agents. METALLIC COMPANY, 437-A North Clark St., Chicago.

JOIN!



Heed Their Appeal

Learn AVIATION

Come to LINCOLN TRAIN NOW AT THIS GOVERNMENT

APPROVED SCHOOL for a good position as Pilot, Mechanic or Aeronautical Engineer. Good Salaries Paid. Many make \$200 to \$600 a month. Exceptional employment opportunities. Our Graduates regularly taking positions. Lincoln can train YOU for a good position. **WRITE TODAY** for full information.

LINCOLN AIRPLANE & FLYING SCHOOL
6012 Aircraft Building Lincoln, Nebraska

ENGINEERING DEGREE IN TWO YEARS

B.S. Degree courses in engineering: Electrical, Civil, Chemical, Mechanical, Radio and Television, or Aeronautical. 1 yr. Mech. Drafting. Intense, practical, thorough program Prep. courses without extra charge. Earn board if desired. Low tuition. Enter March, June, Sept., Dec. Catalog.

243 E. Washington Blvd., Fort Wayne, Ind.

INDIANA TECHNICAL COLLEGE

CARTOON YOUR WAY TO SUCCESS!



DON'T COPY - LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course has 26 lessons and 600 illustrations. **\$2.85**

Send name and address for free details. Only.....

RAYE BURNS SCHOOL, Dept. S-1, Box 2194, CLEVELAND, O.

Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.

AMERICAN SCHOOL OF PHOTOGRAPHY

3601 Michigan Avenue Dept. 1369 Chicago, Illinois

RADIO

ENGINEERING, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. Nine months' engineering course equivalent to three years' college radio work. School established 1874. All expenses low. Catalog free.

Dodge's Institute, Nye St., Valparaiso, Ind.

AVIATION



If you are interested in a comprehensive Technical Training Program for

APPRENTICESHIP MECHANICS PILOTS METEOROLOGISTS

Write, immediately, enclosing stamp—**MECHANIX UNIVERSAL AVIATION SERVICE CO.**

Wayne County Airport Box 857 Dept. H Detroit, Michigan

BE A PASSENGER Traffic Inspector

Opportunities for our Trained Graduates. Write for the story of Railway and Bus Traffic Inspection. We place graduates at up to \$15 per month, plus expenses, to start or refund tuition. Interesting work! Splendid opportunities. Free Booklet.

Standard Business Training Institute, Div. 312, Buffalo, N.Y.



MECHANICAL DENTISTRY

A profession offering unlimited opportunities. Most modern and complete course embracing every branch from Plate to Porcelain Work, which prepares you to work for Dentists or start your own business. Individual instruction—practical training in day or night school. No books—no classes. Catalog upon request.

McCARRIE SCHOOL OF MECHANICAL DENTISTRY

207 N. Broad St. Dept. 664 Philadelphia, Pa.

"DON'T GO A-WOOING WITH A STEWING PIPE!"



"NO DAUGHTER OF MINE can go with a young whippersnapper who smokes such rank-smelling tobacco. Clean that pipe! Switch to a mild, tasty blend like my Sir Walter!"



SMART GIRL! She swiped her father's 2-ounce tin, and now they've got the old boy's blessing—plus the world's most biteless blend of sweet 'n' fragrant burleys!

SWITCH TO THE BRAND OF GRAND AROMA



HOW TO TAKE CARE of YOUR PIPE

FREE BOOKLET tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for your copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky, Dept. Y-812.

TUNE IN Tommy Dorsey and his orchestra. Every Wednesday night, coast-to-coast, NBC Red Network.

Be An ARTIST



Trained Artists Earn \$35, \$50, \$75 Weekly
You Can Learn at Home This
Proven, Practical Way

More and more trained Artists are needed each year. Magazines, advertisers, newspapers, printing houses, etc., pay good money for art work. Our simple, proven method makes it fun to learn Commercial Art, Cartooning and Designing AT HOME, in spare time.

Two Big Artist's Outfits Given

Drawing board, paints, brushes and all materials you need come with very first lessons. The second outfit is given later in the course. Actual fun learning to draw this way.

Write Today for FREE BOOK

Our Free Book "Art for Pleasure and Profit" describes wonderful opportunities in this fascinating field and gives full details of our simple method of instruction. Tells all about our students—their successes—what they say—actual reproductions of their work—and how some earned money even while learning. Tear out and mail coupon below. State age.



\$40 Extra Per Month

In spare time, writes student R. G. Reid, Jr. of Oklahoma.

Paid for Course
 W. R. Kent of New Jersey earned more than twice the tuition while studying.

\$25 for One Drawing

One small picture brings easy money to Miss Goldie Hill of Kansas.

FREE BOOK gives details!

Washington School of Art, Studio 1312E
1115—15th St., N. W., Washington, D. C.

Yes! I am interested in learning to draw. Please send me your Free Book, "Art for Pleasure and Profit."

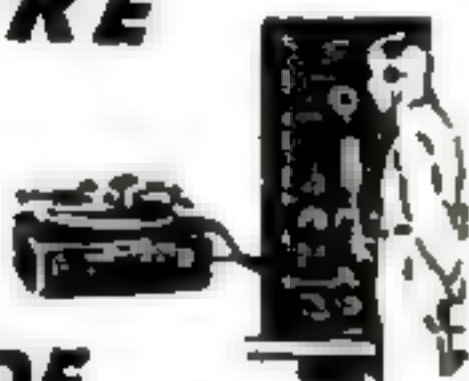
Name Age

Address

City State

DO YOU LIKE RADIO TELEVISION

DOES THE FUTURE OF INTEREST YOU?



Send for your free copy

You men anxious to make good in radio and related industries want the true facts—you want to know about employment opportunities and requirements. National Schools—a million-dollar trade school—will supply you with a sincerely honest statement of facts on what you should do to get into the profitable radio industry. No exaggerations—no misstatements. Mail coupon today. [Send for your free copy. Real facts on radio employment requirements. You need real experience. National offers complete training with modern equipment.]

NATIONAL SCHOOLS
Los Angeles

Request for FREE BOOK of DETAILS

NATIONAL SCHOOLS,
 Dept. PSR-12, 4000 S. Figueroa St., Los Angeles, Calif.

NAME Age

ADDRESS

CITY STATE

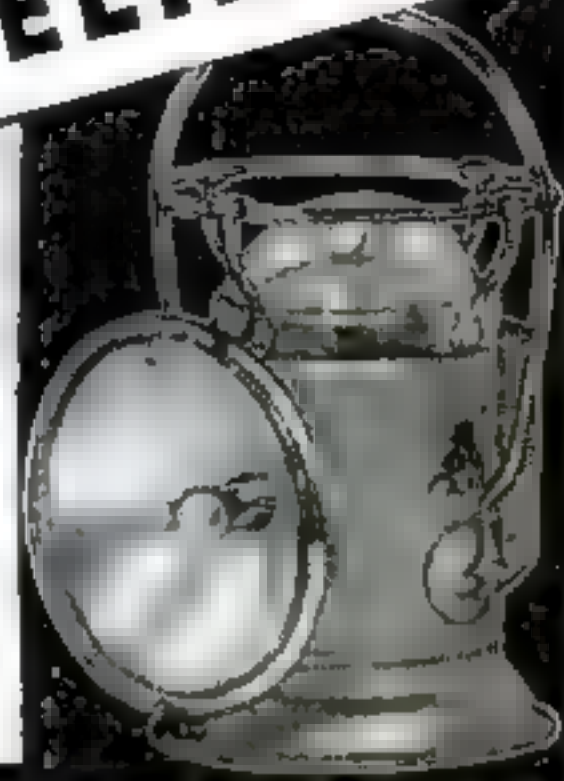
BUY ONE OF THESE

\$1.50
 Less Battery



"BIG LITE" DELTAS

\$3.35
 Less Battery



POWERAY (above) New 6-volt electric lantern with powerful 70 ft. spot beam 80-100 hours light 4 1/2 in. reflector. Unbreakable lens.

POWERLITE at side America's finest electric lantern 6 volt 2 reflectors - front, side 300 ft beam top, gives wide flood light 80-100 hours light. Unbreakable lens. At sport, hardware and electrical dealers or write direct to **Delta Electric Co., Marion, Ind. Dept. 400**

RUPTURED?

Get Up-To-Date Relief

Why try to worry along with old-fashioned trusses that gouge your flesh—press heavily on hips and spine—enlarge opening—fail to hold rupture? You need the Cluthe. No harness. Automatic adjustable pad seals opening—follows every body movement with instant increased support in case of strain. Cannot slip. Holds rupture whether at work or play. Light, easy to wear. Waterproof. Can be worn in bath. Send for amazing **FREE** 100 page, cloth-bound book "Advice To Ruptured" and details of liberal truthful 60-day trial offer. Also names of grateful patrons in your neighborhood. Write today. Cluthe Sons, Dept. 14, Bloomfield, New Jersey.

New Adding Machine Fits Vest Pocket!

Adds, subtracts, and multiplies, up to one billion—yet it costs only \$2.95. Weighs only 4 ounces. Not a toy—guaranteed workmanship. Perfectly accurate, very fast. Sells to business men, storekeepers, homes—wherever figures are used. Grab this opportunity. Write at once for **FREE** Sample Offer and Money-Making Plan, 100% Profit! **AGENTS**
VE-PO-AD, Dept. 153
303 W. MONROE ST., CHICAGO



Learn Public Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence and increase earning power, this easy way. Write for free booklet, *How to Work Wonders With Words* and requirements. **North American Institute, Dept. 1369**
3601 Michigan Ave., Chicago, Illinois



CARTOONING

FREE TRIAL LESSON in CARTOONING. Cash in on your sense of humor with professional cartoons—AT HOME—BY MAIL. Send stamp for **FREE TRIAL LESSON** and further details. **MOON GAG-CARTOON SCHOOL, Box 106—Dept. B, Fall Creek, Wis.**

Earn Cash at Home!



We paid M. M. \$1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn suitable. We furnish materials, buy all crops through out 25 branches. Write today for "Guaranteed Success Plan" backed by \$5000 bond. Established 1908.

UNITED MUSHROOM CO.
3848 Lincoln Ave., Dept. 339, Chicago.

EARN THE DEGREE

Doctor of Psychology (Ps D.), Philosophy, Science, General Courses—Arts, Law, Business, etc. "CHARTERED BY STATE OF MONTANA." Send for 32-page **FREE** Bulletin at once. No Obligation. **Temple Bar College, Dept. B, 213 East Main Street**
Missoula, Montana, U. S. A.

DON'T BUY—SAVE \$ \$ \$

ON RADIO SETS—PARTS, TUBES, PHONOGRAPH RECORDS—UNTIL YOU HAVE SENT FOR OUR NEW GIANT MONEY-SAVING CATALOGUE. **UNITED RADIO COMPANY, DEPT. G, NEWARK, N. J.**

MIND POWER



A FREE BOOK

Develop your personal, creative power! Awaken the silent, sleeping forces in your own consciousness. Become Master of your own life. Push aside all obstacles with a new energy you have overlooked. The Rosicrucians know how, and will help you apply the greatest of all powers in man's control. Create health and abundance for yourself. Write for Free book, "The Secret Heritage." It tells how you may receive these teachings for study and use. It means the dawn of a new day for you. Address: Scribe N.F.E.

The Rosicrucians

SAN JOSE —AMORC— CALIFORNIA

"The Rosicrucians are NOT a religious organization"

THERE'S MONEY IN YOUR CAMERA!

Others make good incomes selling pictures to publications. **FREE CATALOG** describes home-study course (which may be paid for in easy installments) and tells how **YOU** can do it too! **Universal Photographers, Dept. 312, 10 West 33 Street, N. Y. C.**

IDEAS ARE WORTH CASH!

Create practical new ideas—earn money! Big market. Find out if you have ability. Send for **FREE** test—no obligation. Dept. 3, **TIBOLT-CHURCHILL INSTITUTE, P. O. Box 2191, Philadelphia, Pa.**

Your VOICE!

100% Improvement Guaranteed or Tuition Refunded!

You to be sole judge! Strengthen and master your voice—not with singing lessons—but by scientific silent exercises, successfully taught for over a century. **Marvelous success with DEFECTIVE Voices.** Write for Free Voice Book. Learn **WHY** and **HOW** you can now have the voice you want. If under 17, we require parent's signature. With 100% improvement guaranteed—will you faithfully follow instructions? If so, **WRITE!** **Perfect Voice Institute, Studio 1369, 64 E. Lake St., Chicago**

BUCHSTEIN'S FIBRE LIMB

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities. Agents wanted.

P. BUCHSTEIN CO.
810 3rd Ave., So., MINNEAPOLIS, MINN.

Send for Catalog Today



EASIEST TO MASTER!

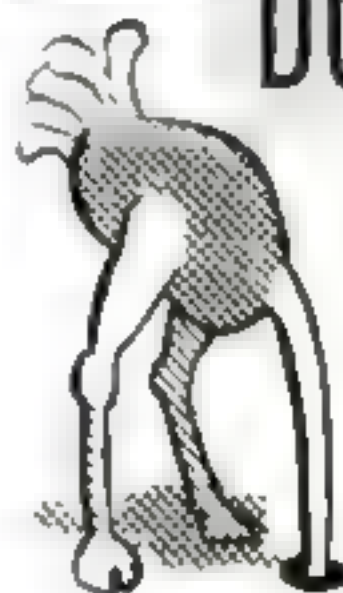
THIS NEW P-A

● Such beautiful tone, and so easy to play! Just touch a key and blow normally; you can't miss. Nothing to compare with these new P-A Saxes, Clarinets, Trumpets, and other P-A instruments. Fully guaranteed; your success assured. See your music dealer or write direct for beautiful free book. No obligation. Easy terms. Greatest fun, easiest with P-A. Write today sure. 1234

PAN-AMERICAN
1204 P-A Bldg., Elkhart, Indiana



Listen Pal, DON'T BE AN OSTRICH



"Don't keep your head 'buried in the sand'...when it comes to the kind of work you're going to do the rest of your life. You're playing ostrich...whether you realize it or not...if you fail to look at what's happening in Air Conditioning. Believe me, I know...because I'm in Air Conditioning and have an interesting, good-pay job, with an unlimited future ahead of me."

Words like these come from the mouths of Thermo Institute graduates who have stepped into Air Conditioning—the field which financial authorities call the next industrial giant. It's so big even now...and growing so fast...that the supply of men with proper training is lagging far behind. Get into this great new field...get the training you need, through Thermo Institute courses. The same superior, practical training is given at any one of the three Thermo schools you choose to attend...or you can start your training at home immediately, no matter where you live. For complete information send the coupon below.

THERMO

AIR CONDITIONING INSTITUTE

Completely Equipped Laboratories and Schools at

LOS ANGELES—194 South Alvarado Street

CHICAGO—125-B West Hubbard Street

NEW YORK—1755-B Broadway

Not connected with any other institution or schools.

Please send information on Thermo Institute training, and free copy of booklet "The Air You Breathe."

NAME _____ AGE _____

STREET _____

CITY _____ STATE _____ 19-5

(Send this coupon to Thermo Institute address nearest you)

Please mention **POPULAR SCIENCE** when writing to advertisers.



**Beware -
Alkalize**

An Alka-Seltzer
Tablet in a glass of water makes a sparkling pleasant-tasting solution. Drink it and it gives quick relief from Headaches, Sour Stomach, Distress after meals and other common ailments. It also helps overcome excess acid condition so often associated with these troubles.

TUNE IN
THE NATIONAL
BARN DANCE
SATURDAY NIGHT
NBC NETWORK

30¢ & 60¢ PKGS.
OR BY THE GLASS
AT DRUG STORES
SODA FOUNTAINS

Alkalize with Alka-Seltzer AT ALL DRUGGISTS

WHEN YOU GO OUT
TO HAVE YOUR FUN,
KEEP ALKA-SELTZER
HANDY.
TO CHASE AN UPSET
STOMACH OR
A HEADACHE,
IT'S A DANDY.

A MERRY CHRISTMAS TO YOU ALL.
GOOD HEALTH AND JOY AND PEACE.
WITH ALKA-SELTZER AT YOUR CALL,
MAY ALL YOUR TROUBLES CEASE.

EARN MONEY MAKE COLOR GLAZED CONCRETE PRODUCTS

MAKE Color glazed concrete patterns without molds or castings. Use a simple, easy-to-use, secret, cheap material. Glazed tiles, walls, grave-stones, etc. **MEN ONLY!** Write for **FREE** color plate, catalog and this new money-making business.

NATIONAL POTTERIES COMPANY
Room 7 13 W. 26th St. Minneapolis, Minn.

don't WORRY

**ABOUT
RUPTURE**



Why put up with years of needless discomfort and worry? Try a Brooks Automatic Air Cushion. This marvelous appliance permits the opening to close, yet holds reducible rupture securely, comfortably—day and night. Thousands report amazing results. Light, neat-fitting. No hard pads or stiff springs to chafe or gouge. Made for men, women and children. Durable, cheap, **Sent on trial** to prove it. Never sold in stores. Beware of imitations. Write for Free Book on Rupture, no-risk trial order plan, and proof of results. All correspondence confidential. **BROOKS COMPANY, 459 State St., Marshall, Mich.**

Enjoy **BEAUTIFUL**
Natural-Looking
FALSE TEETH

LOWEST PRICES

SEND NO
MONEY

60
DAYS'
TRIAL

We make **FIT-RITE** teeth by **MAIL** from impressions taken in your home. Have thousands of patrons. **MONEY-BACK GUARANTEE** of satisfaction. Monthly payments possible. **FREE** mouth-forms, directions, catalog. **WRITE TODAY!** C. T. Johnson, Pres.
UNITED STATES DENTAL COMPANY
Dept. 1242 1555 Milwaukee Ave. Chicago, Ill.

BE OUR REPRESENTATIVE IN YOUR TERRITORY

If you can spare an hour a day you can earn extra dollars taking care of Popular Science Monthly new and renewal subscriptions in your locality. Complete instructions and supplies will be sent **free**. Send your name and address to

EUGENE WATSON, Popular Science Monthly
353 Fourth Ave. New York, N. Y.

Statement of Ownership, Management, Circulation, etc., required by the Act of Congress of March 3, 1933, of Popular Science Monthly, published monthly at New York, N. Y., for October 1, 1938, State of New York, County of New York, ss. Before me, a notary public in and for the State and county aforesaid, personally appeared A. L. Cole, who, having been duly sworn according to law, deposes and says that he is the Business Manager of Popular Science Monthly and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse of this form to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are Publisher, Popular Science Publishing Co., Inc., 353 Fourth Avenue, New York, N. Y.; Editor, Raymond J. Brown, 353 Fourth Avenue, New York, N. Y.; Managing Editor, None, Business Manager, A. L. Cole, 353 Fourth Avenue, New York, N. Y. 2. That the owners are: Popular Science Publishing Company, Inc., 353 Fourth Ave., New York, N. Y.; Stockholders of Popular Science Publishing Company, Inc., Mansell and Company, 45 Wall St., New York; Alice A. Fisher, Greenwich, Conn.; Oliver B. Capen, Bedford Village, N. Y.; Noreen S. Capen, Bedford Village, N. Y.; Robert Cade Wilson, 683 Springfield Avenue, Summit, N. J.; Ada B. Wilson, 683 Springfield Avenue, Summit, N. J.; Marguerite N. Cole, Valley Road, Plandome, L. I., N. Y.; John Nichols, 353 Fourth Avenue, New York, N. Y.; C. D. Freeman, Hinsdale, Ill. 3. That the known bondholders, mortgagees and other security holders owning or holding 1 percent or more of the total amount of bonds, mortgages, or other securities are: none. 4. That the two paragraphs next above giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner, and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

(Signed) A. L. Cole, Business Manager.
Sworn to and subscribed before me this 28th day of September, 1938.
Esther Eyl, Notary Public, Kings County Clerk's No. 63, Registry No. 171. New York County Clerk's No. 174, Reg. No. O-E-111.
(Seal) My Commission expires March 30, 1940.

No Wonder DIESEL PAYS SO BIG!



Diesel Engines produce "LOW COST" power—the newer ones are unbelievably light in weight. High Speed trains, passenger busses; huge trucks and now airplanes have adopted **DIESEL POWER**. Think what that will mean in the way of opportunities for **DIESEL TRAINED MEN**.

Learn Diesel at Home

Get into this profitable field **NOW**—prepare for an ever increasing demand—know the answer to any Diesel problem. We train you at home in **SPARE TIME**. No need to waste a minute or interfere with work or pleasure. Prepare for advancement the Diesel way. Get in line for a Big Pay Job. Write for **FREE** bulletin—there is no cost or obligation.

AMERICAN SCHOOL

Dept. D 946 Drexel at 58th Chicago

Want a Career in photography?

Profit by the growing demand for photographs! Wonderful money-making opportunities in *Commercial, News, Portrait, Advertising and Motion Picture Photography*. Train at home or in our modern, completely equipped studios. 28th year. Send for free booklet.

NEW YORK INSTITUTE OF PHOTOGRAPHY
10 West 33 St. (Dept. 5) New York City

PINS
30¢ UP

FREE CATALOG

Finest quality. Over 300 artistic designs. Write for our attractive free catalog and select a beautiful pin or ring for your class or club.

Dept. O, METAL ARTS CO., Inc., Rochester, N.Y.

RINGS
1.50 UP

BUILD ELECTRIC FENCE

Costs nothing to build. Operates on car battery or hot shot. 35¢ brings complete plans and valuable catalog listing over 500 electrical items.

LEJAY MFG., 823 LeJay Bldg., Minneapolis, Minn.



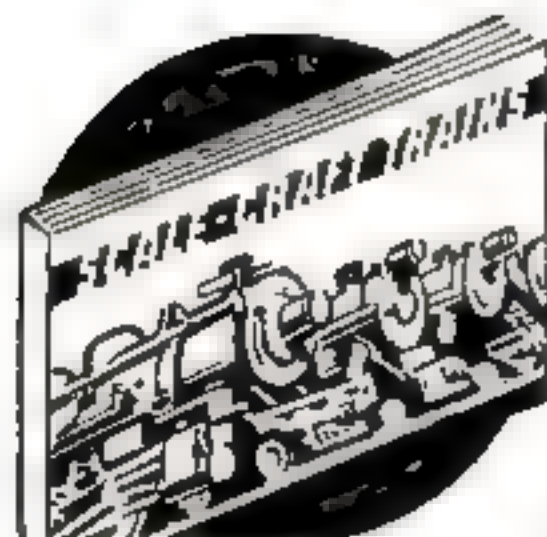
NOW ONLY
\$5.00

REAL ENGINE VALUE

Over 7,000 GHQ Gas Engine Kits have been sold at \$8.50. Now is your chance to buy the *New Improved* kit for \$5.00. Absolutely complete with coil, plug, etc. For boats and planes. Send only \$1. Shipped Exp. Coll. for balance same day. Catalog 3c. **DEALERS WRITE.** A screwdriver is the only tool needed. Average assembly time 30 minutes.

GHQ MOTORS, 854S East 149 St., New York, N.Y.

WHO Said Model Railroading TAKES UNUSUAL SKILL?



• Only those who don't know the whole fascinating story of this thrilling hobby! It's all set forth in the new *Scale-Craft Catalogue*, a perfect gold mine of useful information, colorful facts about railroading, charts, diagrams, illustrations—a complete guide to all aspects of model railroading from the first exhilarating steps of the beginner to the very latest developments in new-style equipment. Fun to read! Invaluable for constant reference! Send 25c for your copy today to **Scale-Models, Inc.**, Dept. B, 1516 S. Wabash Ave., Chicago, Ill.



WANT A GOVERNMENT JOB?



Start \$1260 to \$2100 a Year MANY 1939 APPOINTMENTS EXPECTED

Railway Postal Clerks

Railway Postal Clerks get \$1,900 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,450. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.)



3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100 and \$2,300.

File Clerk—Clerk

Open to Men—Women 18 to 50. Entrance salary \$1,260—\$1,440 year. Appointments as File Clerks and Clerks in the Departments at Washington, D.C., are made from this examination.

Many Other Positions

Many other positions are obtainable. Those wishing these positions should qualify at once.



Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

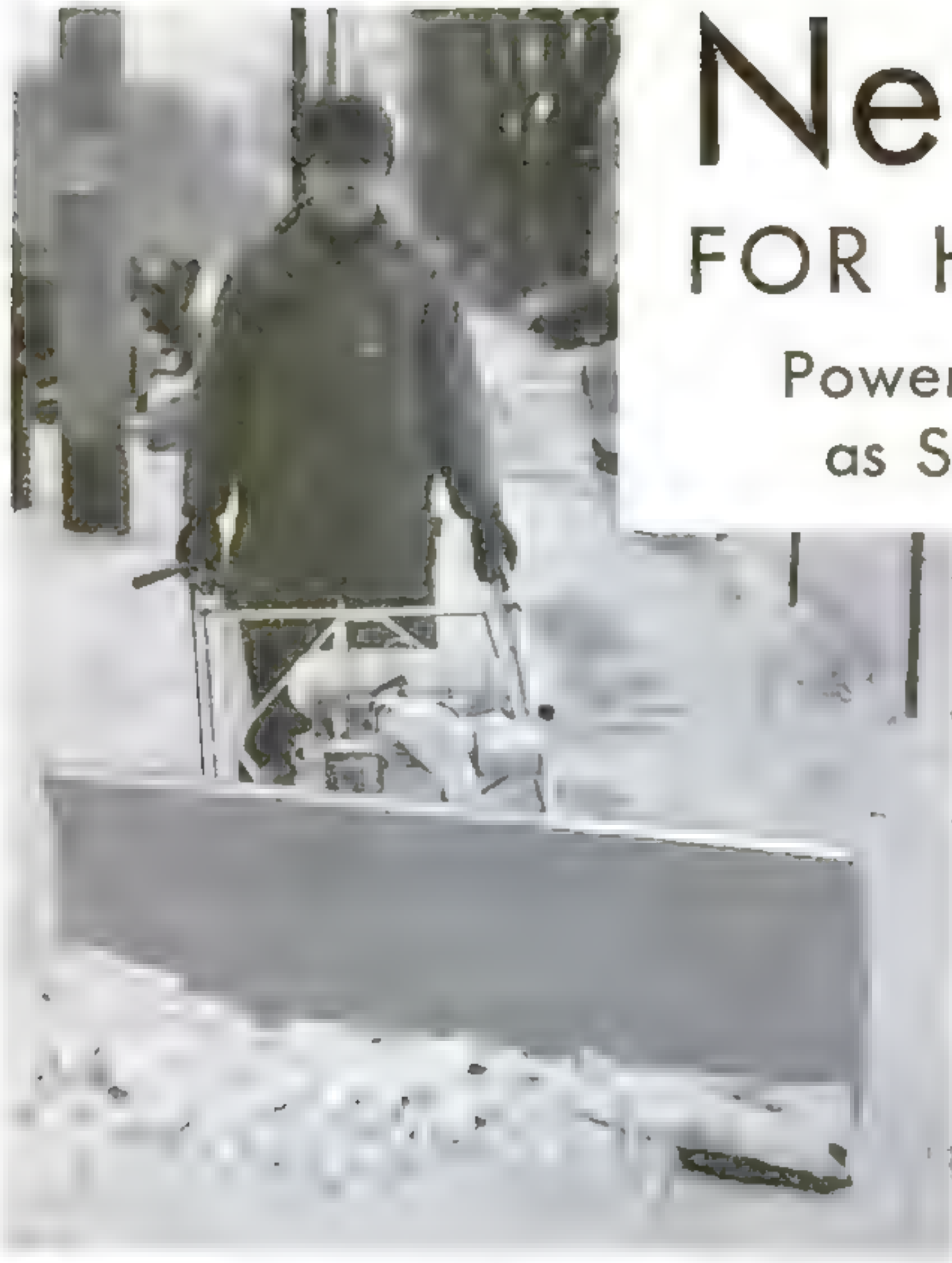
FRANKLIN INSTITUTE, Dept. C255, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "How to Get a U. S. Government Job"; (3) List of U. S. Government Jobs; (4) Tell me what to do to qualify for a U. S. Government Job.

Name

Address

Use This Coupon Before You Mislaid It. Write or Print Plainly.



New Ideas FOR HOME OWNERS

Power Lawn Mower Serves as Snow Plow in Winter

INSTEAD of being stored away after the summer, a pneumatic-tired power lawn mower now on the market can be used as a sidewalk or driveway snow plow in winter. For winter use, the cutting unit is removed and a plow blade bolted directly to the side pieces of the mower frame. The plow, fifty-one inches wide and twenty-one inches high, is adjustable to various angles and levels. Four heavy pneumatic tires provide an efficient tractive surface for the combination unit, which is driven by a three-horsepower gasoline motor. A slight downward pressure on the handles of the power plow lifts the blade off the ground for turning or transporting.

Brush of Flame Loosens Paint Quickly

PRODUCING a flattened, brushlike flame, the nozzle of a paint-burning apparatus recently introduced makes it easy to remove old paint from walls and house exteriors at maximum speed. Burning a mixture of air and acetylene gas, the unit has a needle valve at the nozzle for regulating the length of the flame and the degree of heat. Removal of paint can proceed about as rapidly as the high-temperature flame can be brushed over the surface, the paint being softened immediately and removed with a putty knife or scraper. When properly handled, the brushlike flame will remove several coats of paint without danger of scorching or charring the painted surface. After removing the softened paint by means of the putty knife or scraper, no further preparation of the surface is needed before repainting. The photographs at the right show the brush-flame paint burner in use.



New paint-burning apparatus in use. The brushlike acetylene flame loosens paint, which is removed easily with a scraper

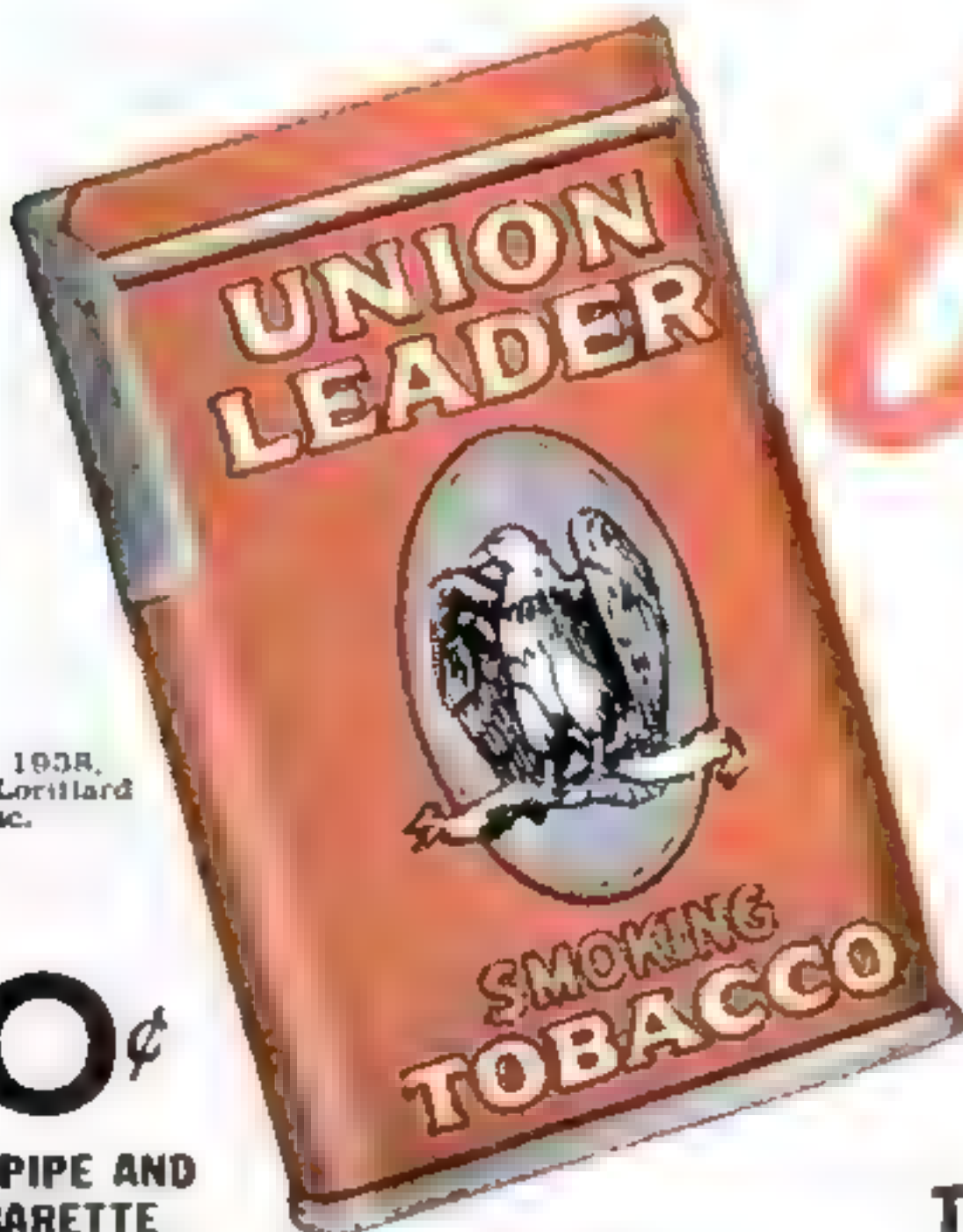
Old friends are true friends



IN 1914 . . . "This picture is out of the family album, which is fittin' in connection with Union Leader. Because it was my old Dad who told me, when Union Leader was introduced at the turn of the century, 'Son, come what may, you'll never find a finer tobacco than Union Leader!'"



TODAY . . . "This snapshot proves how true my Dad spoke. For here I am, 81 now, and puffing on the old pipe filled with Union Leader. The mellowness and mildness of Union Leader make it a life-time pal for any man."—Thomas H. Taylor, Lake Luzerne, N. Y.



Copy, 1938,
by F. Lorillard
Co., Inc.

10¢
FOR PIPE AND
CIGARETTE

Union Leader

ALWAYS . . . UNION LEADER has won the lasting friendship of smokers through its flavor, mellowness and mildness. Flavor from rich hill-grown Kentucky Burley. Mellowness nurtured by long aging. Mildness which results from a special "bite-removing" process. No wonder smokers call Union Leader the friendliest of smokes! Try a tin today.

THE GREAT AMERICAN SMOKE

COMFORT CONTROLS OFFER UNIQUE HEATING SERVICE



Dotted lines show how a circulating heater sends hot air to the ceiling and helps warm adjoining rooms. Arrows indicate radiant heat being directed by Superfex Comfort Control Shutters into the "living zone" and down to the floor.



• SUPERFEX, alone among oil burning heaters, has these adjustable Comfort Control Shutters thus permitting practical use of both circulated and radiant heat at the same time. The Superfex operates hour after hour without attention . . . gives continuous cozy warmth overnight. Dial regulates heat volume. Burns wide variety of inexpensive fuel oils available everywhere. Easy to own on monthly payment plan. Choice of sizes. Beautiful porcelain enamel finish. Radiant Heat-

*The Mark
of Quality*

ers, too. See them at your dealer's. Coupon will bring FREE booklet.



SUPERFEX

OIL BURNING HEATERS

A PRODUCT OF PERFECTION STOVE COMPANY

PERFECTION STOVE COMPANY
7611-C Platt Avenue, Cleveland, Ohio

Send me your FREE BOOKLET on the Superfex Heat-Director . . . also Radiant Heaters.

Name _____

St. or R.F.D. _____

Post Office _____

County _____ State _____

Boards Bend to Any Shape

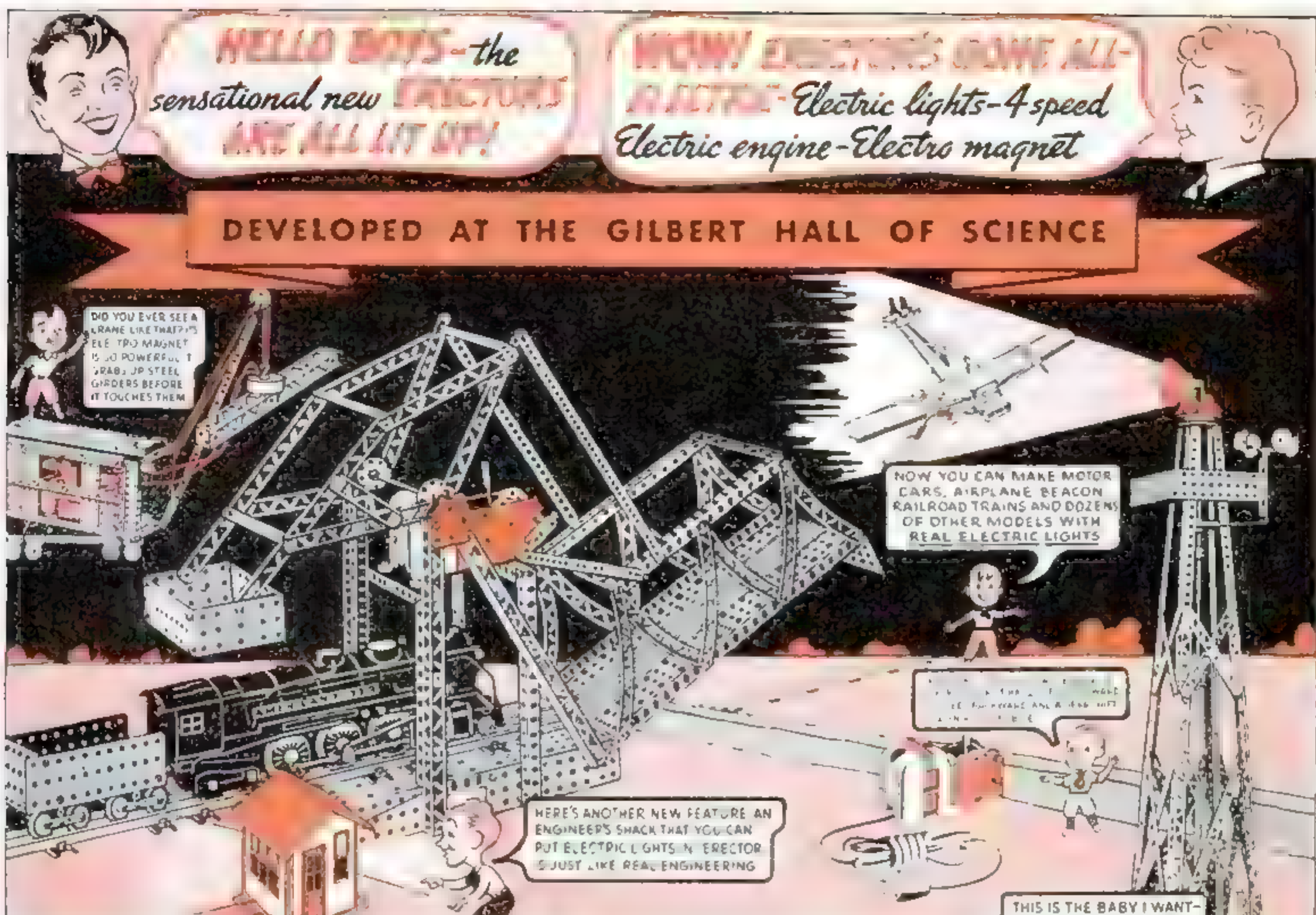


COLUMNS and curved surfaces of wood are easy to form with lightweight flexible-wood boards now on the market. Four feet wide, ten feet long, and one eighth inch thick, the boards can be curved with the grain to form columns having diameters as small as six inches. Ivory in color, the flexible wood takes either oil, lacquer, or tempera paints.

New-Type Storm Window Has Sash of Steel



TAKING less than one minute to install, a new type of storm window has a lightweight steel sash. Attached from the inside, as shown in the photograph above, and held in place by easily operated locks, the sash has an adjustable opening for ventilation.



BOYS! Leading toy stores are showing a sensational new kind of Erector this year. An Erector that makes model-building more fun than the movies—more exciting than a football game. Because Erector has gone **ALL-ELECTRIC**.

Now, for the first time, you can build a revolving airplane beacon with real electric searchlight—construct electrically lighted railroad trains, Ferris wheel, airplanes, motor cars,—erect electric bridges that open and close—make mighty cranes that grab up steel girders by electro-magnetic power.

You can build all the engineering marvels you see on this page—and 100 more—with **ONE** Erector Set. Put dazzling electric lights on them. Make them buzz with action with the new 4-speed Erector electric engine. There are more blood-tingling thrills in the new All-Electric Erector than in a dozen ordinary toys. Tell Dad that Erector is your No. 1 choice of Christmas presents.

The Sensational New **ALL-ELECTRIC** ERECTOR

Get a load of the sensational, new No. 8½ Erector. Crammed with exciting electrical and structural parts. Electric lights—110 volt electric engine with 4 speeds and automobile-type gear shift—powerful electro-magnet. Also, polished steel boiler shell—big red wheels—steel girders and structural plates—gears and pinions—a total of 18 lbs. of parts for building over 100 colossal, engine-driven, electrically lighted engineering marvels. Price \$12.95; other Erectors from \$1.00 to \$27.50.



A Christmas gift from A. C. Gilbert the inventor of Erector! The Mysterious Erector-scope. Brings you sights so amazing you can scarcely believe your own eyes. Free with catalog of New All-Electric Erectors.

THIS ERECTORSCOPE SURE IS SNAZZY

own eyes. New All-

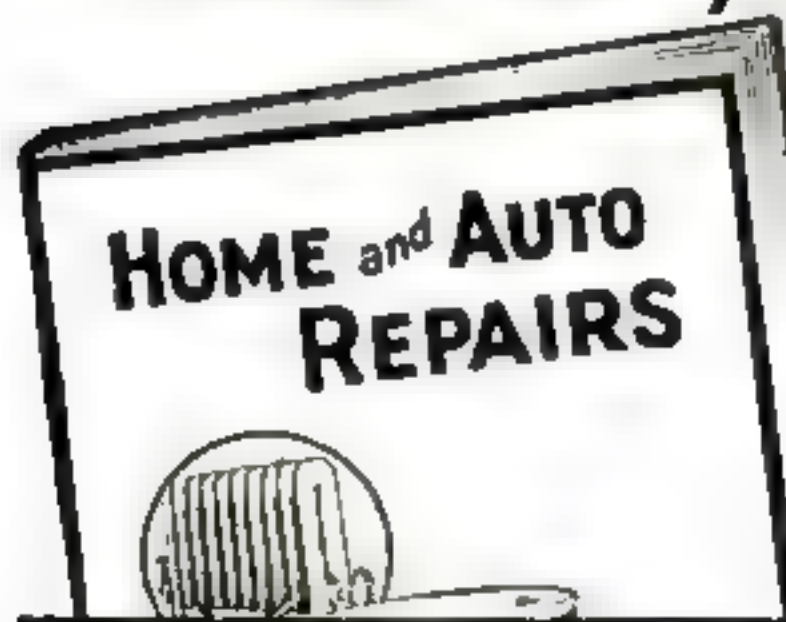


Rush Coupon or 1c Post Card
Mr. A. C. Gilbert
Gilbert Hall of Science,
32 Erector Square, New Haven, Conn.

Quick! I want one of your Mysterious Erectorscopes and advance catalog on your new All-Electric Erector. Rush both FREE.

NAME
STREET
CITY..... STATE

HOME OWNERS:- This was written for you and is sent

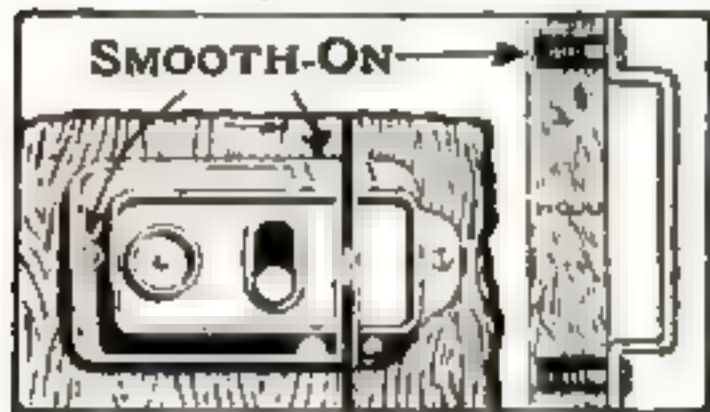


FREE

Get your copy!

DO your own simple home, auto and motorboat repairing and be independent of outside repair men. You will avoid delays, save much money, and have the satisfaction of knowing that the work is well done.

The booklet contains clear diagrams and directions for correct procedure for hundreds of common jobs, and enables any home worker to get dependable results, *easily*, on any of the following:



Tightening loose locks

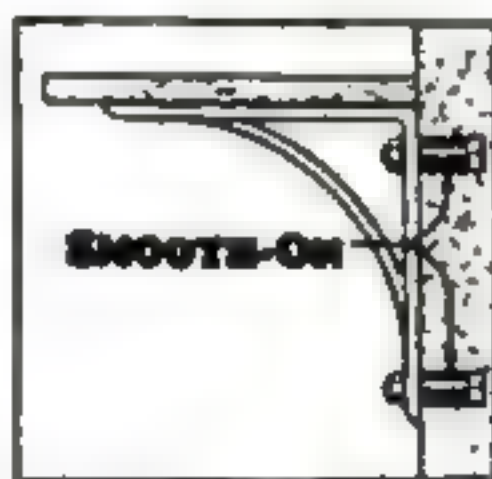
Stopping leaks in pipes, heaters, boilers, tanks, radiators, air ducts, smoke pipes, pails, etc., at connections, seams, cracks, rivets or holes.

Tightening or anchoring loose hinges, locks, handles, screws, bolts, nuts, bases, stems, tops, casters, etc.

Making waterproof joints at skylights, roof cracks and flashing.

Making wet cellars dry from the inside, making concrete floors hard, water and oil proof, and non-dusting, making masonry walls waterproof.

On the car:—Stopping leaks in the radiator, at hose connections, or in oil and gasoline lines, patching cracked water jackets, crank, gear and differential cases, tightening loose rivets, mud guards, lamp standards, hub caps and lubricator connections, loose moulding, screws, etc.



Attaching shelves to concrete

Smooth-On iron cement with which this work is done is applied without heat, without special tools, and so easily and inexpensively that half a dollar to half a hundred dollars is saved in each instance.

Smooth-On has been widely used in industrial work for over 35 years and its use is standard practice by power plant engineers and repair men.

Get the booklet by mailing the coupon and buy Smooth-On No. 1 in 7 oz., 1 lb. or 5 lb. can from your hardware store or if necessary from us.

SMOOTH-ON MFG. CO., Dept. 58.
574 Communipaw Ave., Jersey City, N. J.



Please send the free Smooth-On Home Repair Book

Name _____

Address _____

Do it with SMOOTH-ON

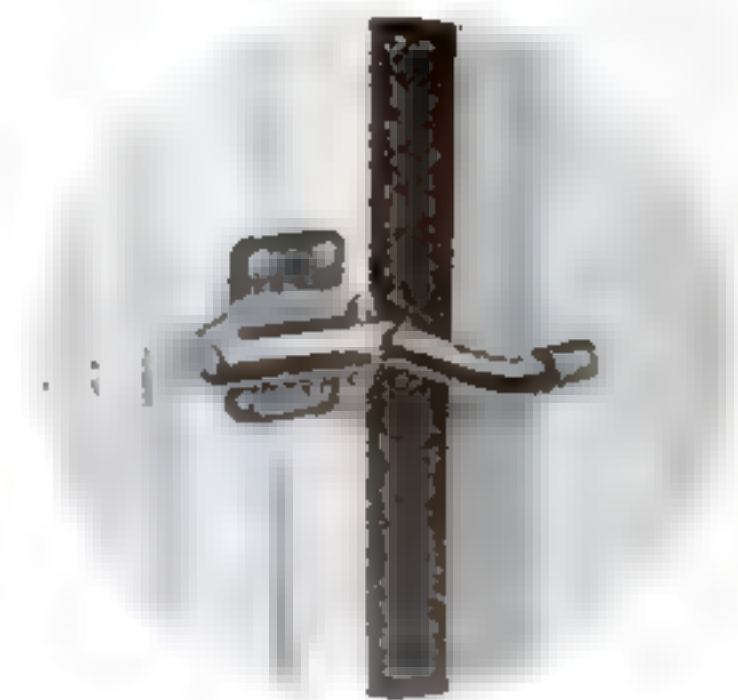


Light Metal Wall Studs Simplify Construction

MADE in one piece, a new steel wall stud, shown in the illustration above, affords simplicity in wall construction and positive locking to floor and ceiling beams. Fireproof, the stud is used in erecting hollow wall partitions that are easy to soundproof and to insulate. The stud is fastened by means of nails, while crosspieces are installed with special clips. It is also used to "carry" pipes, electrical conduits, and air ducts, which can be installed immediately after the erection of the metal studding.

Bar Replaces Door Chain in Safety-Lock Unit

A SOLID, rubber-tipped steel bar replaces the conventional chain in a new type of safety door lock. The pivoted steel bar slides through a slot in the saddle of the unit, which is screwed to the door jamb. Fully extended, the curved bar prevents the door from being opened from the outside beyond a certain point, as illustrated in the accompanying photograph.



DOESN'T IT LOOK EASY?

Yet it's from the famous
"Merry Widow" Waltz!

HERE'S PROOF THAT YOU, TOO, CAN LEARN

JUST strike the notes indicated and you will actually be playing the opening bars of one of the world's favorite musical compositions! And it's just as easy to play other famous melodies, too, when you use the wonderful "Note-Flinder."

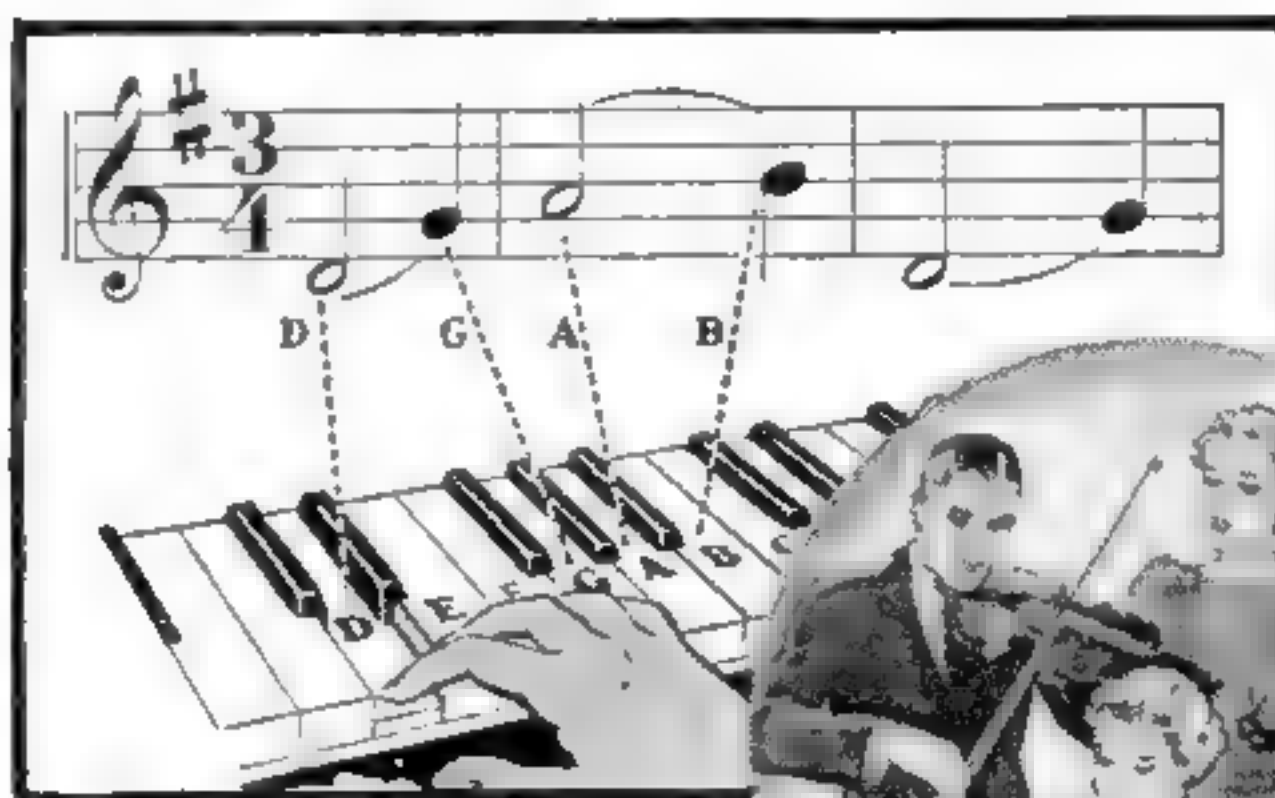
This invention of the U. S. School of Music takes the mystery out of the keyboard, does away with tedious study and practice, enables anyone to play a real tune almost from the start. And that's the way this modern method works. You learn to play by *playing*. Soon you will be thrilled and delighted to find that you can pick up almost any piece of popular music and play it at sight. And that applies to the piano or violin, the saxophone or guitar, the accordion or whichever instrument you choose for your own!

Takes only a few minutes a day!

LEARN TO PLAY BY NOTE

Piano Guitar
Violin Saxophone
Organ Mandolin
Tenor Banjo
Hawaiian Guitar
Piano Accordion
Or Any Other
Instrument

Over 700,000 people all over the world have taken advantage of this easy way to learn music at home. Don't let old-fashioned ideas deprive you of the joys of playing any longer. You don't need special talent or previous knowledge of music. No tedious months of drills and exercises. Mail coupon and see how easy it is to learn music at home this quick, modern way. U. S. School of Music, 812 Brunswick Bldg., New York, N. Y. (Est. 1898)



FREE

Demonstration Lesson
Shows how this easy method works. Handsome, illustrated booklet also included. No cost or obligation. Simply mail the coupon. Note: instruments supplied when needed, cash or credit.



U. S. SCHOOL OF MUSIC

812 Brunswick Bldg., New York City, N. Y.

Send me your amazing free book, "How You Can Learn Music in Your Own Home," with inspiring message by Dr. Frank Crane; also Free Demonstration Lesson and particulars of your easy payment plan.

Name.....

Address.....

Instrument..... Have you Instrument?.....



BOEING SCHOOL OF AERONAUTICS

VANCE BREEZE, Test Pilot and Vice-President Bennett Aircraft Corp., says: "I know no better start for a career in aviation than Boeing School training."

United Air Lines founded and maintains School, directly supervises training methods. Men determined to succeed in aviation invited to send for latest BOEING SCHOOL BULLETIN—fully describes School and complete range of 15 career courses, contains vocational guide to all fields of aviation—Pilot, Ground and Engineering. Write: Boeing School, Department P-12— Airport, Oakland, California

A PIMPLE-FACED OUTCAST AT 17?

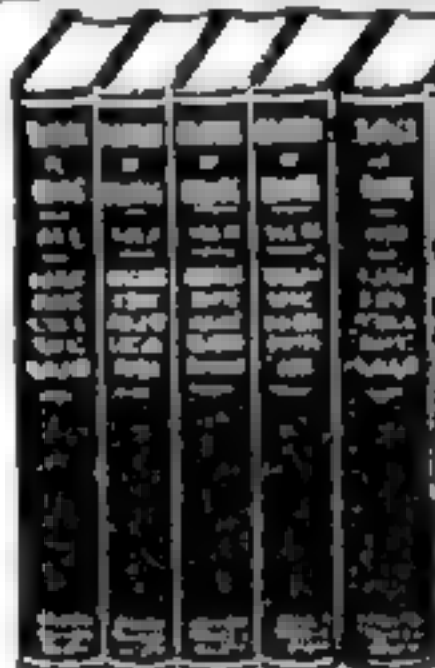
Read how to help protect the skin
against intestinal poisons

Are you shunned and pitied because of repulsive-looking hickies? Then why not get right at a common cause of this trouble—and take steps now to help overcome it?

Between the ages of 13 and 25, final growth takes place. This is often accompanied by disturbances throughout the body. The skin may become over-sensitive. Waste poisons from the intestines often get into the blood, then ugly pimples may break out.

Many young people help solve this problem—simply by eating Fleischmann's Yeast. Each cake of this famous fresh food helps eliminate intestinal waste poisons from your body before they can get into the blood stream . . . and so gives these pimples a chance to clear up.

Don't run the risk of permanent scars by neglecting such pimples. Start eating Fleischmann's Yeast now—3 cakes daily—one cake ½ hour before meals. Begin now!



DRAFTING

BOOKS SENT FREE!

ON APPROVAL
5 VOLUMES BRAND NEW EDITION

Only 15 minutes a day with these WONDER BOOKS can prepare you for a good drafting job in less than a year. Mechanical and architectural drafting from simple straight lines to important complex plans. A step at a time! Built especially for beginners, for men with only grammar schooling. Drafting room practice, PLUS ENGINEERING, made easy and clear. Includes complete course in blueprint reading.

Big Field Big Demand Big Pay
Competent draftsmen are urgently needed right now in all building and manufacturing lines at \$30.00 to \$75.00 a week. That's just the beginning—FOR DRAFTSMEN HAVE THE BEST CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, easy to learn and do. Learn quickly with these books—send coupon for a set and see for yourself.

A year's consulting membership in the American Technical Society now given to all readers of this famous cyclopedia of drafting. Many say that it is worth more than the cost of the books.

Complete set of drawing instruments if you send for these drafting books NOW. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. Real \$10 value, but included with these books.

AMERICAN TECHNICAL SOCIETY
Dept. D920, Drexel at 58th St., Chicago, Ill.

American Technical Society, Dept. D920, Drexel at 58th St., Chicago, Ill. Send for 10 days' trial New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return books in 10 days and owe you nothing but if I decide to keep them, I will send \$2.00 after 10 days, then only \$3.00 a month until \$24.80, the advertising price, is paid. Send latest edition and include drawing instruments and Membership Certificate.

Name.....

Address..... Attach letter stating age, occupation, employer's name and address and that of at least one business man as a reference.

5 reasons why
CASCO *is the*
MASTER
WORKSHOP
GLUE



1. WEATHERPROOF BOND. A different kind of glue, CASCO sets *chemically* like concrete, forms an insoluble bond that resists both heat and moisture.

2. UNIFORM STRENGTH. Processed by laboratories with 30 years' experience in adhesives, CASCO has been proven on many of industry's toughest gluing jobs. Get this strength for *your* gluing... insist on "CASCO Powdered Casein Glue".

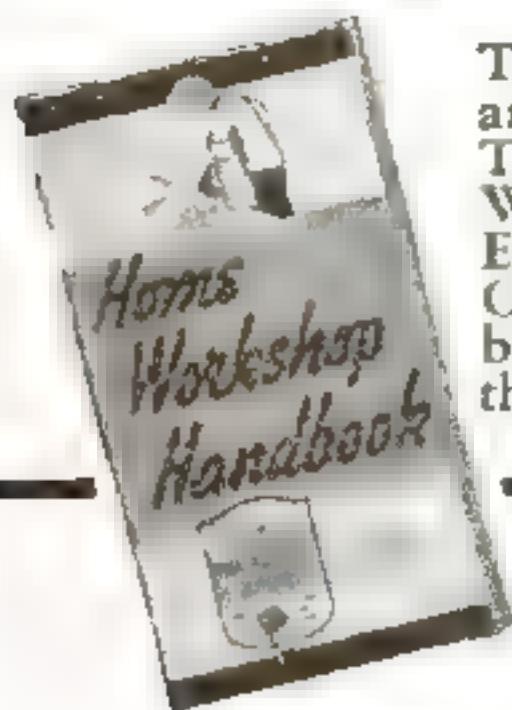
3. USED COLD. CASCO spreads easily, sets at full strength *without heating!* Use it outdoors, indoors, anywhere, any time.

4. EASY TO MIX. No mess. Just add water to enough CASCO for the job—no waste. Quickly forms a smooth, creamy mix.

5. ECONOMICAL. You get CASCO in powder form, *all glue...* no liquid preservatives. 1 lb. of CASCO makes $1\frac{1}{2}$ quarts of full strength glue for 65c!

10c TO 65c AT HARDWARE, PAINT AND LUMBER DEALERS

FREE—New kind of Home Workshop Handbook



Tells how and where to get free and low-cost expert advice on Tools, Free Plans, Finishes, Woods, Veneers, Sharpening Equipment, Home Workshop Clubs, etc. The first handbook to bring you all this information. Send the coupon for your copy, now.

CASEIN COMPANY OF AMERICA
 350 Madison Ave., Dept. PS-1238
 New York, N. Y.

Yes, send me your free "Home Workshop Handbook"

Name _____

Address _____

Save 2c, stick coupon on penny postcard

Questions FROM HOME OWNERS

Q.—How can I remove coffee stains from a parquet dining-room floor? Also, how should I remove the shellac floor coating to refinish the floor without scraping?—S.B., Long Island City, N.Y.

A.—SHELLAC can be removed with denatured alcohol. If the coffee stains have simply discolored the shellac and have not penetrated the wood, they will, of course, come off with the shellac. If the coffee has penetrated the wood, the stain should be scrubbed with a saturated solution of oxalic acid or any powerful bleaching agent. The bleached spot should be well washed and neutralized with vinegar before applying a new finish.

Making Whitewash Stick

C.E.C., RED LODGE, MONT. Alum may be added to whitewash to prevent the latter from chipping or rubbing off once it is applied to a wall. Flour has also been used for this purpose. Mix a half pint of flour with water and then pour on enough boiling water to thicken the flour mixture. While still hot, the flour mixture is added to the whitewash.

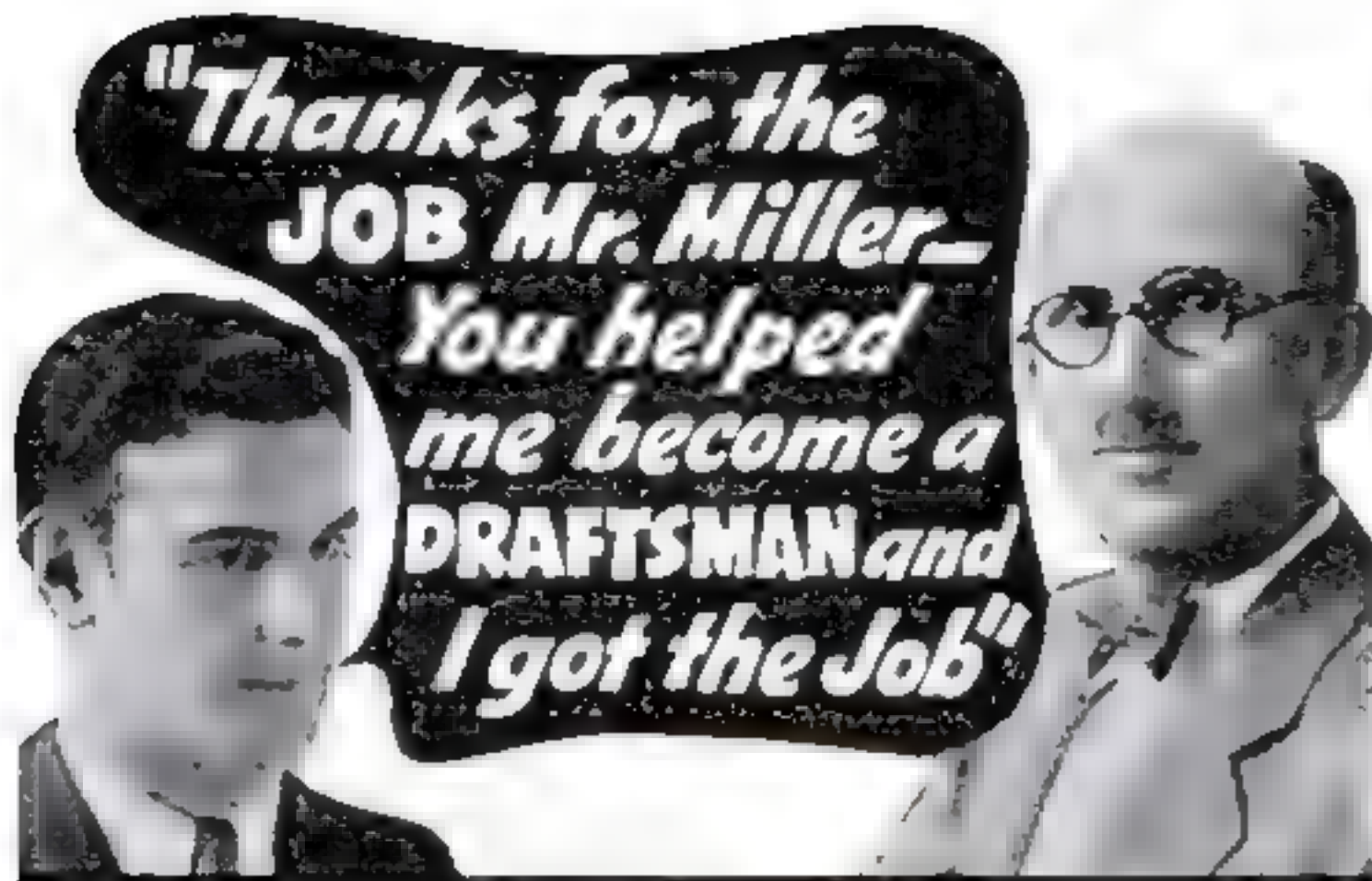
To Clean Car's Seat Covers

Q.—BEFORE storing away the wicker seat covers we use in our automobile during the summer months, I should like to give them a thorough cleaning. What is the best way to do this?—K.J.F., Nashville, Tenn.

A.—ORDINARY soap and water should do the trick, but if it doesn't, try a cleaning fluid made by dissolving a tablespoonful of trisodium phosphate in a pail of water. A weak solution of tartaric acid in water is often used for cleaning and bleaching straw hats, and will prove useful for natural-color straw seat covers also.

Fixing Leaky Gutters

J.M., GARFIELD, N. J. Leaky metal roof gutters may be repaired by lining them with a strip of composition roofing material. The strip should be cut to fit snugly and conform to the shape of the gutter without wrinkling or buckling. If joints are made, be sure that the higher strip overlaps the lower one. Coat the inside of the gutter with lap cement, asphalt emulsion, or hot asphalt. It is also a good plan each year when cleaning out the repaired gutter to give the lining a coating of high-grade asphalt roof coating. This should extend the life of the gutters.

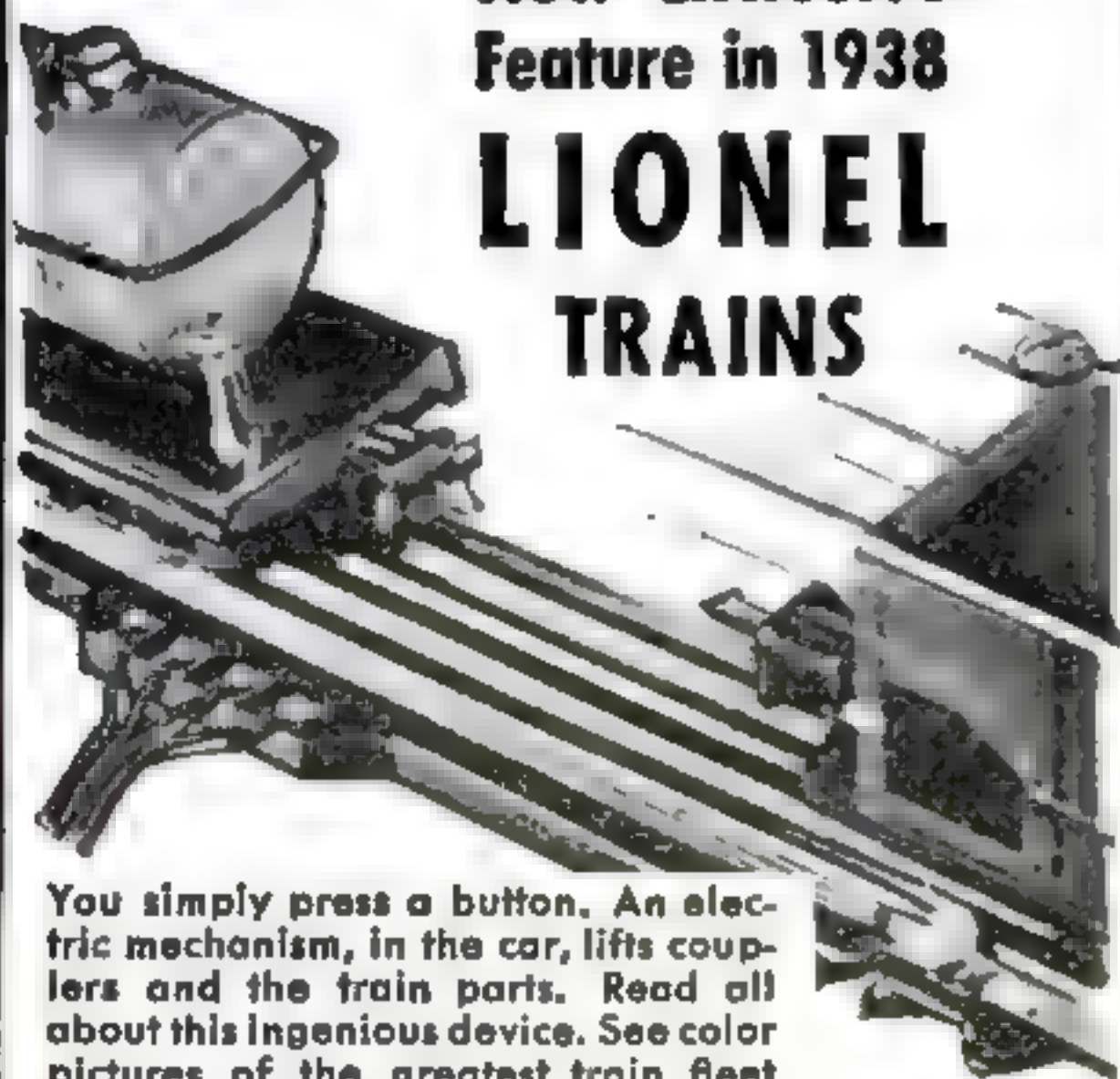


Thousands of letters like this have been written to prove that **DRAFTING**, learned the American School way, **DOES PAY**. Here's work you will enjoy, for it's great to see some huge plant or immense building taking shape on the drawing board and the draftsman expects **STEADY WORK** for he is usually among the **first to be hired** and the last to be laid off. Why not get into drafting—have a profession instead of a trade?

Be a Draftsman—
Learn at home We train you thoroughly and expertly in the half hours you can spare from work or pleasure. No need to burn midnight oil. Go as slow or as fast as your time will permit. Lessons are so clearly written that beginners can easily understand them and our system of "practice study" adds **EXTRA VALUE** to the instruction. Use head and hands in this fascinating profession, to make **more money** and put yourself in line for promotion. Write for **FREE** bulletin—there is no obligation of any kind.
O. C. MILLER, Secretary

AMERICAN SCHOOL
 Dep't. D D 946 Drexel at 58th Chicago

ELECTRIC UNCOUPLING



New Exclusive
 Feature in 1938
**LIONEL
 TRAINS**

You simply press a button. An electric mechanism, in the car, lifts couplers and the train parts. Read all about this ingenious device. See color pictures of the greatest train fleet in all train history. Get new catalog NOW. Clip and mail coupon at once.

The Lionel Corporation
 15 East 26th Street, New York, N. Y.

Dept. J J

Enclosed is 10 cents for a copy of the new 1938, 52-page, full color, Lionel Catalog. Send it to:

Name _____
 Address _____
 City _____ State _____



You have fire insurance.
 You don't
 worry—

... AND AFTER



**SEND FOR FREE BOOK
 —BE READY!**



EVERY fire insurance policy states that you must make a complete list of destroyed and damaged property to receive settlement. Get this free "Household Inventory" booklet. It will help you list everything, room by room, before an emergency arises. Send the coupon. No obligation. Address:

THE AMERICAN INSURANCE GROUP
 Dept. 0114, 15 Washington St.
 Newark, New Jersey

Without cost or obligation, please send me a free copy of your booklet, "Household Inventory."

Name M

Street _____

Place _____ State _____

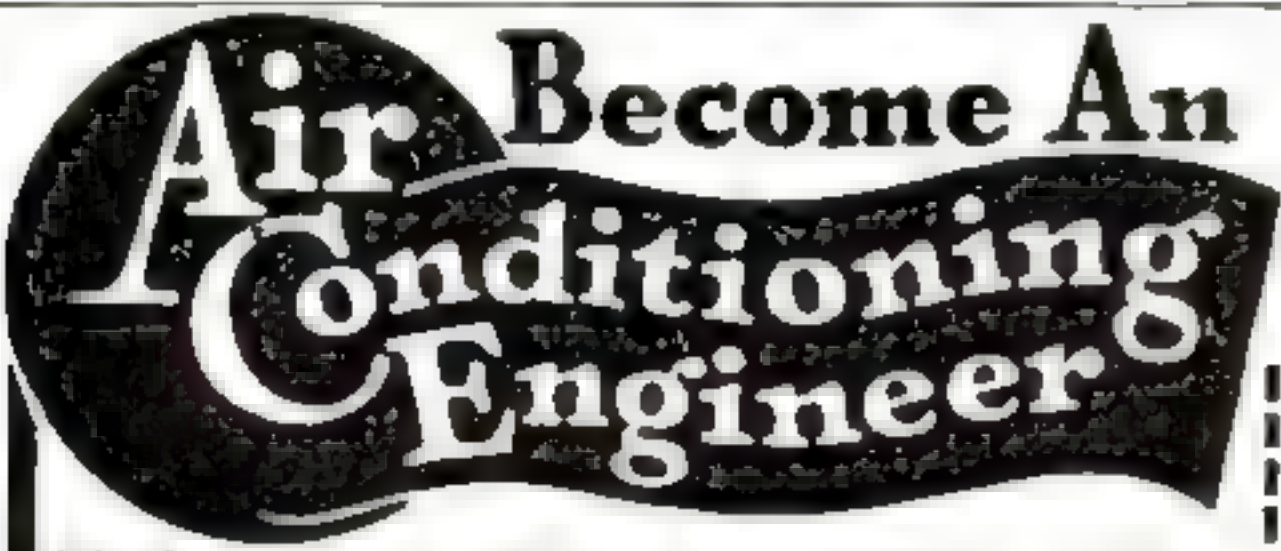
"STALLING ALL CARS! DON'T USE ANTI-FREEZE TILL YOU CLEAN OUT WITH **SANI-FLUSH!**"



OLD MAN WINTER has two strikes on you, if you put anti-freeze in a dirty radiator. Rust and scale choke the cooling system. Your motor overheats. You waste anti-freeze. You waste power. And you risk costly engine repairs. SANI-FLUSH makes it easy and inexpensive to keep radiators clean.

Just pour 10c worth of SANI-FLUSH in the radiator. (25c for the largest trucks and tractors.) Follow directions printed on the can. Run the motor. Drain. Flush. Refill with water and anti-freeze. Then you're all set for the winter. The delicate veins that circulate water are free and open. Motors run efficiently. SANI-FLUSH can't injure motor or fittings. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

Sani-Flush 
KEEPS RADIATORS CLEAN



Big fast-growing field for men trained in design, estimating, insulating, installing and servicing. Offers real opportunities in Air Conditioning new buildings and remodeling worth-while old buildings. Write today for method of how you can prepare for this thriving industry. No obligation.
American School, Dept. AC-946, Drexel at 58th, Chicago

WOOD CARVING and WHITTILING AN ARTISTIC HOBBY FOR ALL

This brand new manual shows you how to do every kind of wood carving. How to carve jewel boxes, picture frames, trays, chests, furniture, etc. How to do chip carving, level surface carving, incising, carving in relief. Carving human and animal figures in the round completely explained and simplified. 256 Pages. Fully illustrated,—full cloth bound. Send only \$2.00 and your copy will be sent postpaid, or order COD plus postage if you wish. *Money back if not satisfied.*

Popular Science Monthly—Dept. 128
353-4th Ave. New York, N. Y.



The HOME CHEMIST

A new book which shows how to set up and operate an inexpensive home laboratory with odds and ends of material available in every home. Many thrilling, practical, useful experiments and tests, entertaining, instructive, valuable, pointing the way to research and new discoveries. Many diagrams and illustrations. Full cloth bound \$1.00.

POPULAR SCIENCE MONTHLY, Dept. 128
353 Fourth Ave. New York, N. Y.

WOODWORKER'S Turning & Joining MANUAL



This new manual is written especially for the man who likes to make things in his own home with power tools. Tells what power machinery you will need to

turn out beautifully finished furniture. How to use the cross cut saw, rip saw, miter saw, jointer, and band saw. How to bore and mortise by machinery.

Scraping method of wood turning fully explained—how to turn a plain cylinder, smooth cylinder, how to use a skew chisel to square ends, how to make shoulder cuts, taper cuts, convex and concave cuts. How to make a tilt-top table, occasional table, reeding and fluting, faceplate and chuck turning, turning rings, veneering. How to make the surface perfect, how to apply stain, wood fillers, finishes—wax, oil, shellac, varnish, lacquer.

Also, how to equip your home workshop, what hand tools you will need in addition to power machinery. All about wood joints.

Complete working diagrams with step-by-step instructions for intricate designs in cabinet making, 236 illustrations, 192 pages, full cloth bound, only \$1.00 C.O.D. Send order WITH NO MONEY for WOODWORKER'S TURNING AND JOINING MANUAL. Pay postman \$1.00 plus few cents postage when book arrives.

POPULAR SCIENCE—Dept. 128
353 Fourth Ave. New York, N. Y.

EASY

SOPRANI AMPLIPHONIC

Simplifies Playing



Frank Papfle,
N.E.C., with
his Soprani

● **Lighter, easier to play,**
less bellowsing, plus
more beautiful tone
and volume, — that's how
Soprani's exclusive Ampli-
phonic feature has simpli-
fied this accordion. Assures
rapid progress. Home trial.
Easy terms. See your music
dealer or send for beauti-
ful free book. Write today.

SOPRANI, INC.

Dept. 1231, 630 S. Wabash Ave.
CHICAGO, ILLINOIS

HARD-TO-GET MATERIALS

Just out — Our twenty-fourth annual catalog of Hard-to-Get Materials for Homecrafters, Schools, Institutions, Antique, Novelty and Cabinet Shops. Most complete line in entire country on this class of supplies. Send 10c in cash or stamps today. (Partial list) Chest hardware, locks, hinges, supports, casters, copper trim, etc., also midgets, overlays, etc. Finishing materials, glue, stains, varnish, wax, flint and garnet papers, rubber sanding blocks, stick shellac, burning-in knives, etc. Upholstering supplies and coverings. Complete line of electrical findings for lamp manufacture, also cluster and indirect fixtures. Chair cane, woven and in strands, splines, reeds, fibre cord, etc. Trays for smoking stands and glass liners. Large line electric and spring clock movements, with and without dials. Complete line Venetian Blind hardware, tapes and cords. Table slides and leaf supports. Tea wagon wheels and casters. Wood dowels, also dowel screws, dowel centers, wood screw hole buttons. Excellent line card table leg supports. Bed hardware of every description. Desk pens, complete with funnel and fastening, without base. Water transfers, inlays, small mouldings, etc. Furniture glides and casters, office chair spiders, wood legs and K. D. chair frames. Small box hardware of every description. Large selection pulls, knobs, handles, hinges, locks, catches, etc. Perforated steel panels, chair braces, revolving chair fixtures, rocker springs, candlestick sockets, bill board clamps, banquet table equipment, many sizes braces, corner irons, hanger bolts. Step ladder braces, plaster strips, sliding track and sheaves. Typewriter desk hardware, bin swings, mirrors, nut bowl hardware. Bar pins for novelties, Catalin Plastics.

THURSTON SUPPLY CO.

Department P. 5.

Anoka, Minnesota

Industry Needs MECHANICAL ENGINEERS

Big opportunities for men with Engineering training. Promote yourself by preparing for jobs as Engineer, Superintendent, Master Mech., Factory Eng., Chief Draftsman, Gen'l Foreman. You mechanically employed men don't have to change lines to win promotion, but do have to get ready for jobs ahead. Write today for method for preparing for this well-paying profession. No obligation.

American School, Dept. M 946, Drexel at 58th, Chicago

New Amazing INVENTION! ELECTROPLATES by BRUSH EASY AS PAINTING!



Easily..Expertly..Cheaply!

SENSATIONAL new discovery
S actually electroplates. It's easy
...just brush it on. Deposits heavy,
durable layer of metal by electrol-
ysis. Results permanent—equal to beautiful
work of costly tank outfits. *Non-liquid*—Portable
—Battery or household current. Take it to the
job. No dismantling...plate where and what
you want. Outfit in sturdy case, complete for in-
stant use. Junior Battery Model \$6.85.

Heavy-Duty Professional Sets up to \$27.50.

AGENTS WANTED: Write at once for Big
Money Proposition.
You can also make steady money plating for others.

WARNER ELECTRIC COMPANY, Dept.
D-2
360 No. Michigan Avenue, CHICAGO, ILL.

LET THE POSTMAN
BRING YOU
THIS 188 PAGE

Catalog
FREE



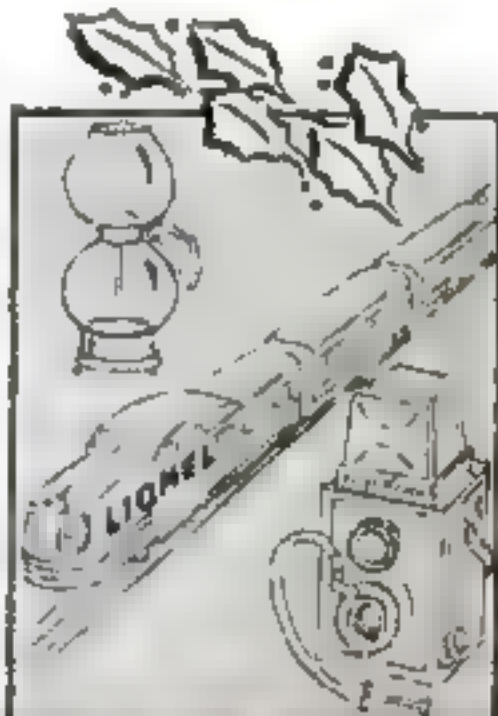
BARGAINS IN
1939 RADIOS
PARTS—TUBES
P. A. EQUIPMENT
HAM APPARATUS
ELECT. APPLIANCES
TELEVISION KITS
CAMERAS

Cover to cover it's
brand new. New
1939 Lafayette Ra-
dios, 60 new models
... every one a
streamlined beauty
and all priced within
easy reach. Com-
plete list of nation-
ally advertised radio
parts and equip-

ment. Sensational new television kit, plus the biggest
selection of build-them-yourself radio kits. New pho-
tography section solid-packed with real values. 188
pages of standout buys! Send for your **FREE** copy. It's
today's buying—and saving—guide.

Special Xmas Catalog

Be sure to send for our special **FREE** Christ-
mas catalog—out now in time for thrifty
Christmas shopping. This year give prac-
tical gifts. Largest selection of gifts any-
where—electric trains, cameras, modern
appliances, electric shavers, radios...
Shop at home in comfort with this greater-
value gift catalog—save time and money.
Check both catalogs on coupon and mail.



WHOLESALE RADIO SERVICE CO. INC.
NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.
100 SIXTH AVENUE • 901 W. JACKSON BLVD. • 345 PEACHTREE STREET
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.

WHOLESALE RADIO SERVICE CO., INC.
100 Sixth Avenue, New York, N. Y.

Rush **FREE** 1939 Gift Catalog No. 75-9M8

Rush **FREE** 1939 Radio Catalog No. 73-9M8

Name _____

Address _____

City _____



LET "VALU-BILL"
BE YOUR SANTA

PASTE COUPON ON PENNY POSTCARD



FAIRBANKS & CARLISLE

present

ANOTHER GREAT RELEASE OF POPULAR SCIENCE-ON-THE-SCREEN

SEE IN COLOR—HEAR THE FLASH-NEWS OF
SCIENCE AND INDUSTRY AT YOUR OWN THEATRE



PRODUCED IN CINECOLOR BY FAIRBANKS AND
CARLISLE WITH THE COOPERATION OF THE
EDITORS OF POPULAR SCIENCE MONTHLY
DISTRIBUTED BY PARAMOUNT PICTURES.

Popular Science Monthly
353 Fourth Avenue • New York, N. Y.

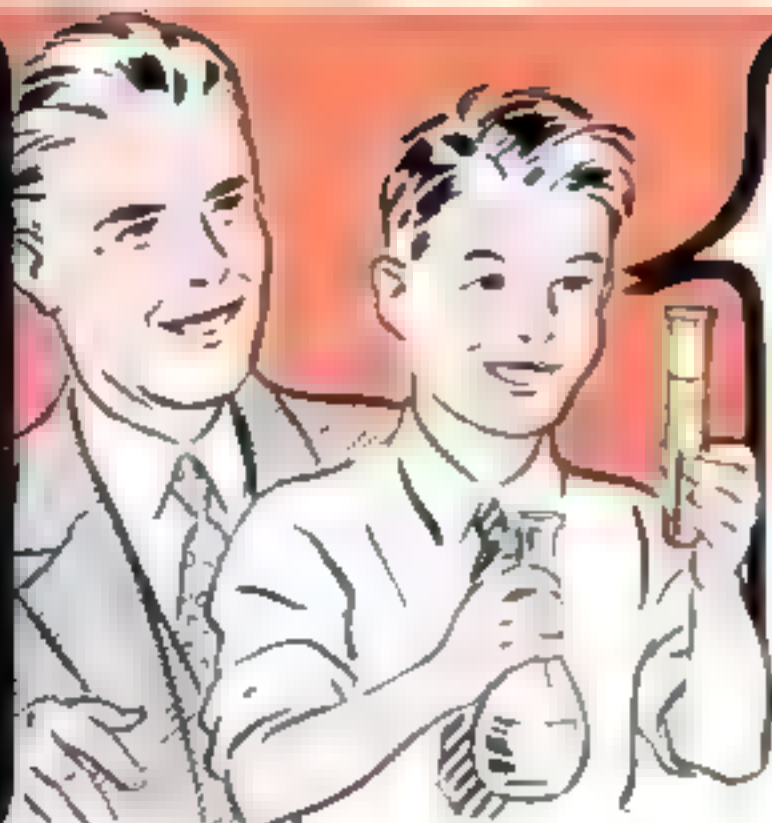
(Paste on penny post card and mail today)
Please make double-sure that *latest* release of
Popular Science-On-The-Screen appears at my
local theatre.

NAME

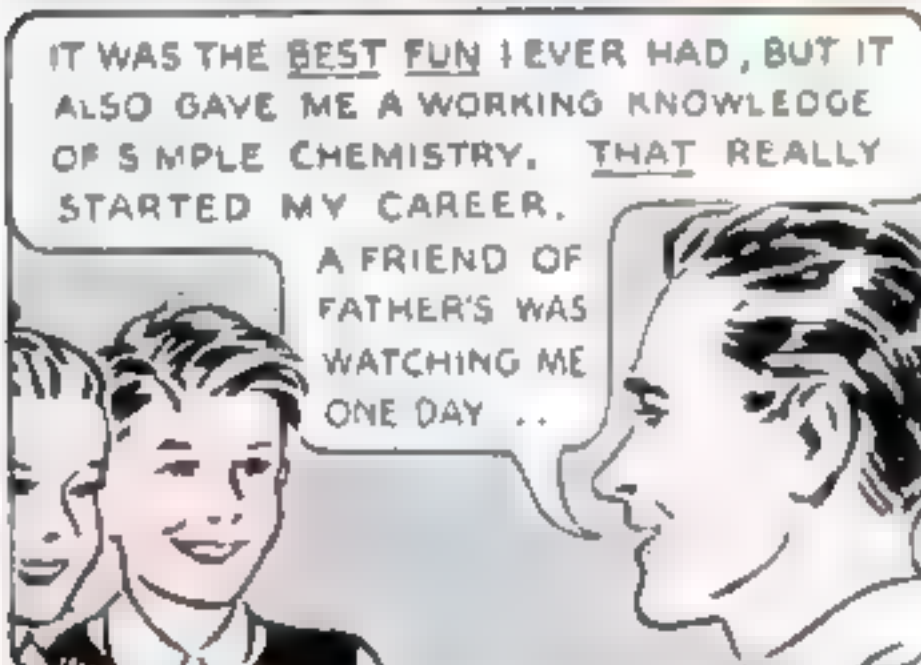
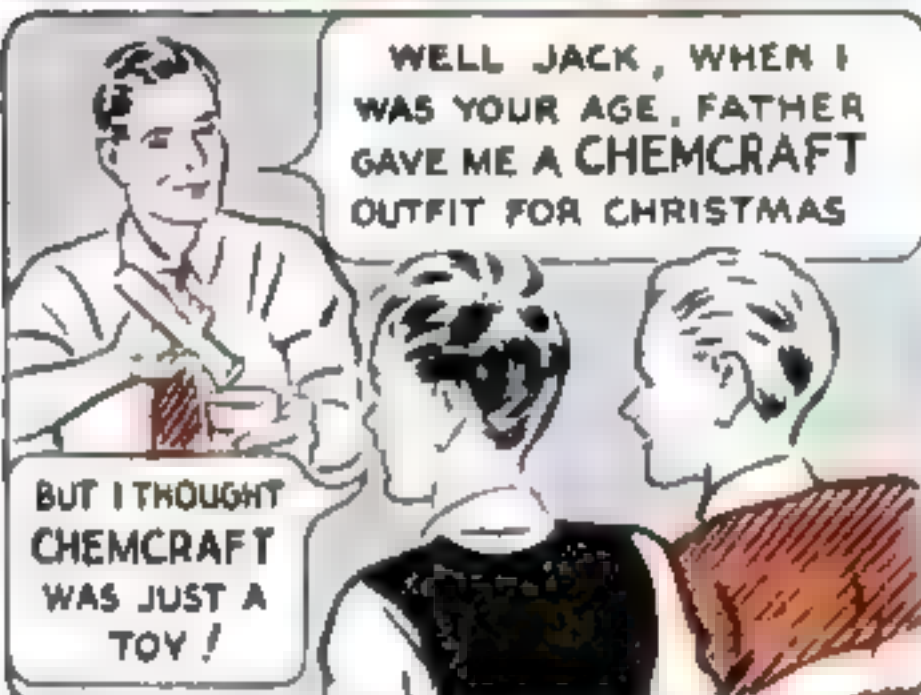
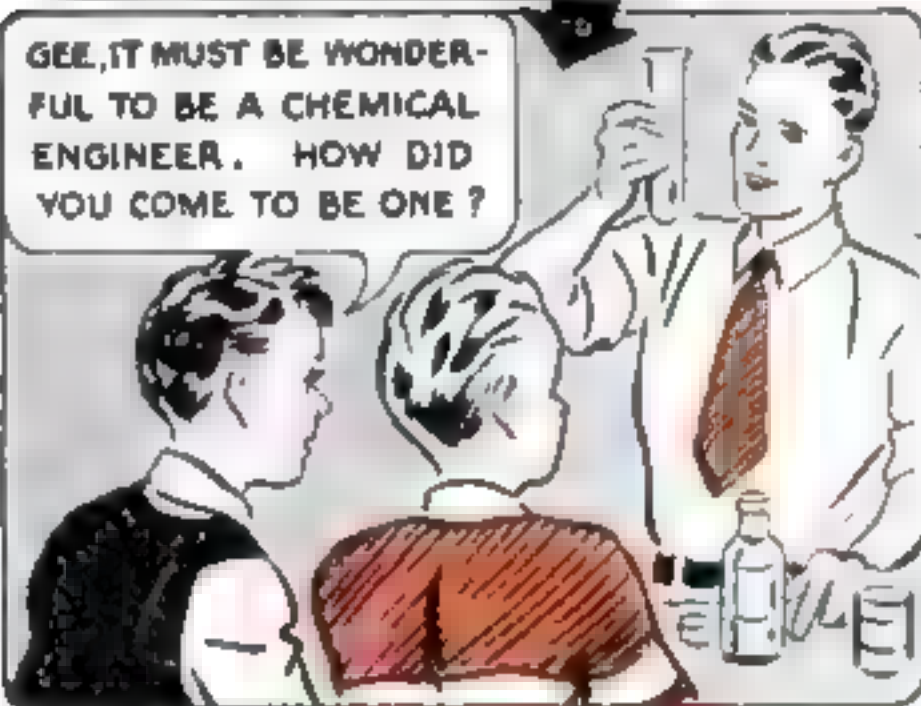
ADDRESS

NAME OF THEATRE

How a "Toy"
Present
LED TO A
BUSINESS
CAREER



**DAD...THIS IS REAL
ADVENTURE!...MY
CHEMCRAFT OUTFIT IS THE
BEST PRESENT I EVER HAD!**



YES, indeed, a Chemcraft Chemistry Outfit is a grand present. Fun? You bet—the greatest fun in the world—real adventure—the thrills of performing hundreds of fascinating and amazing experiments.

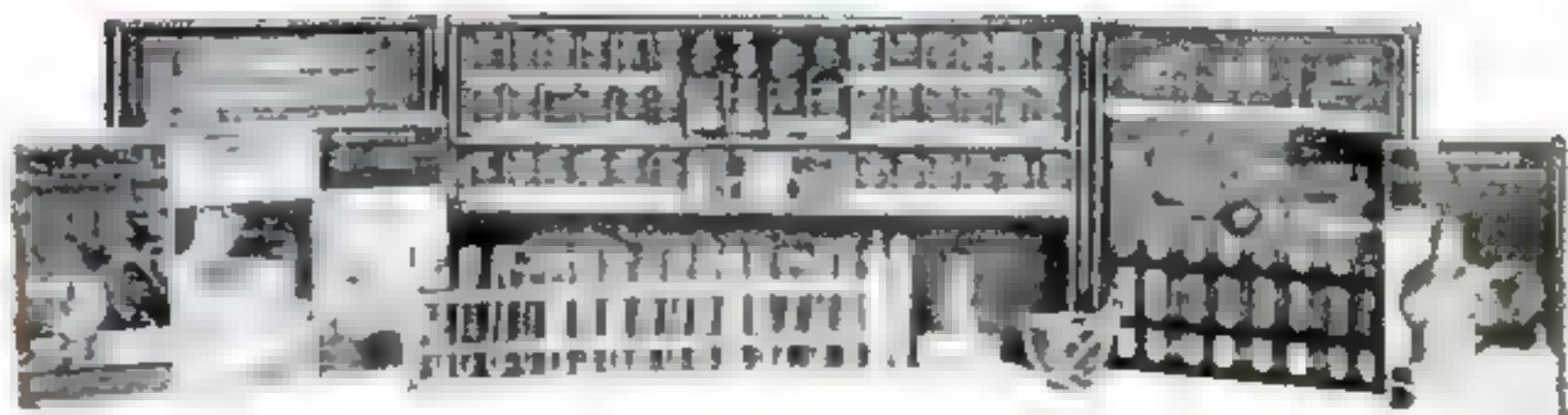
But with the fun you can also secure a practical knowledge of Chemistry—the marvel science that has contributed so greatly to industry, medicine and the progress of civilization. From this simple beginning many youngsters have become important figures in scientific and industrial fields.

Chemcraft Chemistry Outfits are used in schools and colleges and the Instruction Manuals contain valuable information and describe fully how to perform many interesting experiments. Chemcraft Outfits contain no dangerous substances.

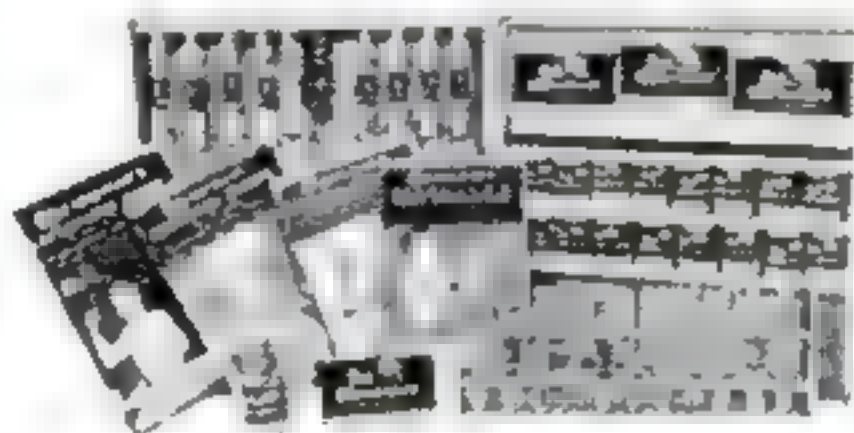
See Chemcraft Chemistry Outfits at your local store priced from \$1.00 to \$25.00. If they do not have them you may order direct from us.

All the thrills and wonders of a real
Chemist's Laboratory are yours with

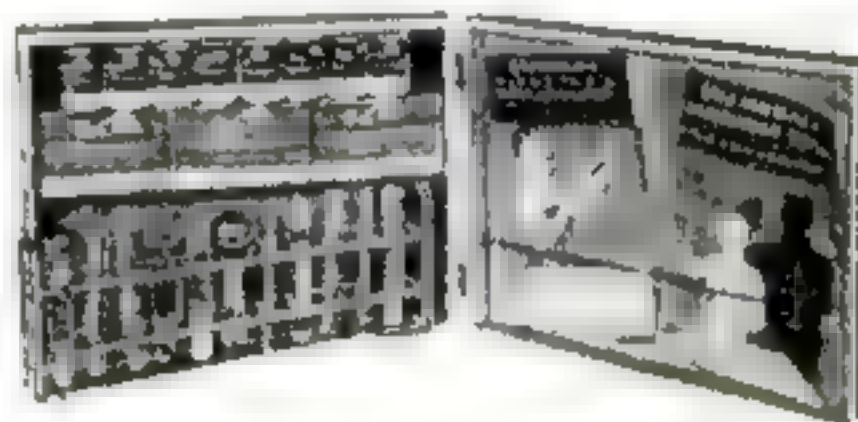
REG. U.S. PAT. OFF.
CHEMCRAFT
CHEMISTRY OUTFITS



Outfit No. 10 Big Lab Style mahogany finished cabinet containing splendid assortment of chemicals and apparatus. Instructions for 730 practical experiments in Chemistry, Electrochemistry, Glass Blowing, and Formulae & Symbols. Price \$10.00



Outfit No. 4 396 fascinating chemical experiments including Chemical Magic, Plans for Home Lab, and Chemical Formulae & Symbols. Liberal quantities of chemicals and apparatus packed in convenient laboratory style wood cabinet. Price \$3.95



Outfit No. 2 A big value outfit in a stand-up wood cabinet. Contains chemicals, apparatus and directions for 184 thrilling experiments including Plans for a Home Lab. Price \$2.00

You'll enjoy this FREE BOOK. Mail coupon.

Our new book "Adventures in Science" is a real treasure house of information and entertainment for the young scientist. It is full of astonishing scientific facts, and tells about many thrilling experiments in Chemistry, Microscopy, Physics,

Biology, Electricity, etc. Book also helps you to construct a home laboratory, and tells how you may become a member of the Chemcraft Science Club.

The Porter Chemical Co.
442 Prospect Ave.,
Hagerstown, Md.



TO BE SENT FREE FOR THE
FREE BOOK

COUPON
The Porter Chemical Company
442 Prospect Ave., Hagerstown, Md.
Please send me your free book "Adventures in Science."

Name.....
Address.....
City.....
State.....

COSTS MORE BY THE GALLON... LESS BY THE WINTER!

Because one shot lasts
from now till Spring—



Put in "Eveready" "Prestone" anti-freeze as early in the fall as you like...drive as hard as you please all winter long...and drain it out in the spring. That's all there is to it. No replacement, no worry, no freeze-ups.

Reason? Certainly there's a reason. "Prestone" anti-freeze can stand engine HEAT as well as winter's cold. It will not boil away, under any winter conditions...even in modern high-efficiency motors designed to operate up to 180 degrees (and even higher)!

To fully realize what this means, consider that the boiling point of a half-alcohol half-water solution is 180 degrees, and that when you stop the motor, circulation stops, accumulated motor heat jumps the solution temperature as much as 20 degrees! This results in losses through the overflow pipe which you may not even see. Your service man calls this "after-boil."

Maybe you can get by with boil-away anti-freeze...but why take chances? Actually, you save money when you buy the *right* anti-freeze in the first place...and that is "Eveready" "Prestone" anti-freeze.

YEAR AFTER YEAR, more and more "Prestone" anti-freeze has been made and sold, yet demand has outrun production. This winter, we expect there will be enough for everyone, for, early in the year, tremendous new production facilities went into full-time operation. Still, to be sure, get yours **EARLY!**

The words "Prestone" and "Eveready" are trade-marks of National Carbon Co., Inc.

for guaranteed all-winter protection

Put in

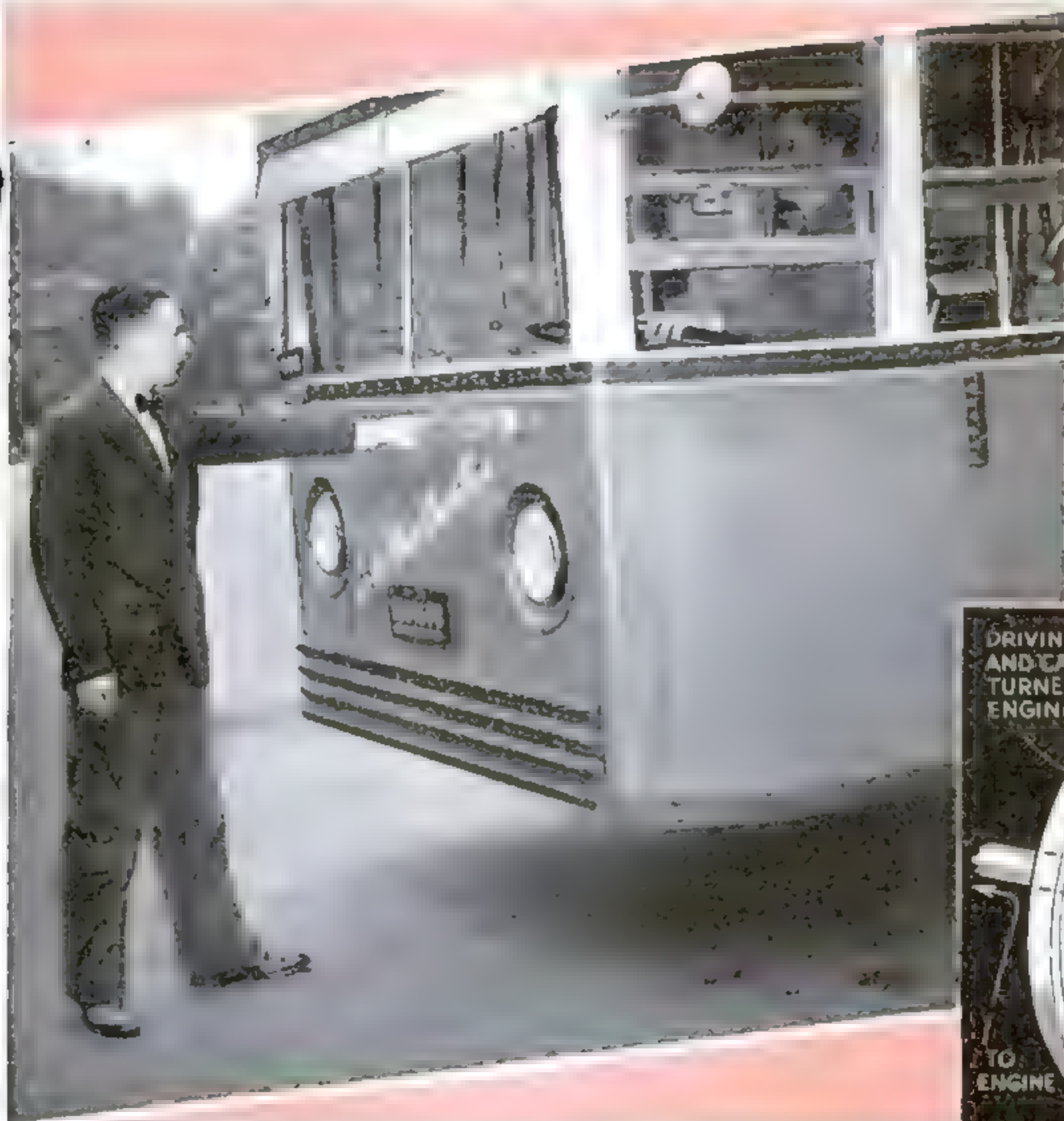
EVEREADY PRESTONE

TRADE-MARKS

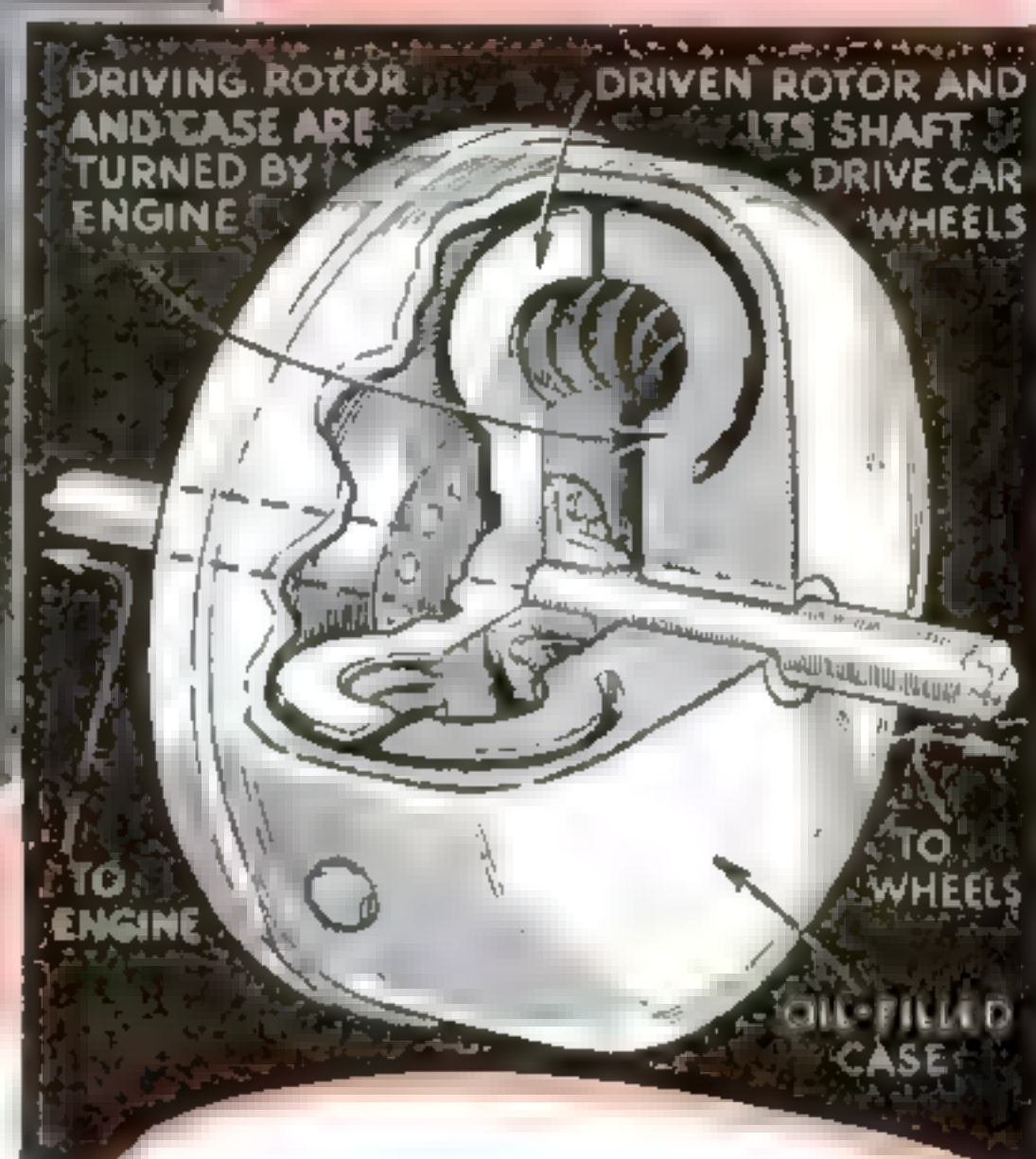
ANTI-FREEZE

COSTS MORE BY THE GALLON LESS BY THE WINTER

Monthly
RAYMOND J. BROWN, Editor

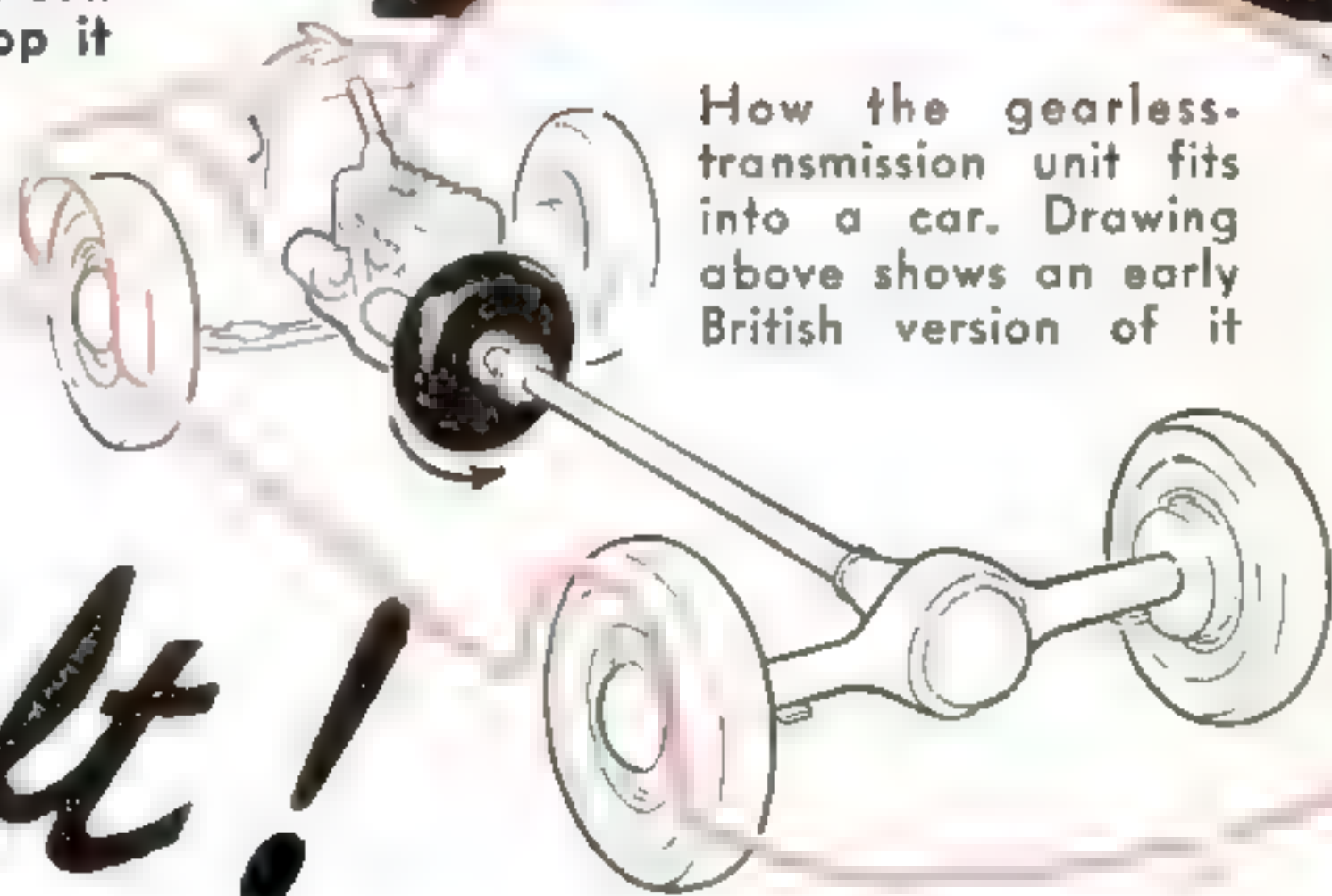


Revolutionary
"Liquid Clutch"
Promises a New
Driving Thrill
for American
Motorists



Equipped with a "liquid clutch," this New York City bus can be started so gently that the push of a finger will stop it

Goodbye Gearshift!



A STARTLING innovation in motor-ing, the "liquid clutch," or gearless transmission, has just made its debut in America. First tried out in an experimental bus, it has proved so successful that 125 more of the busses have been ordered for service in New York and Chicago. Adapting the invention to private motor cars, as has already been done abroad, may be the

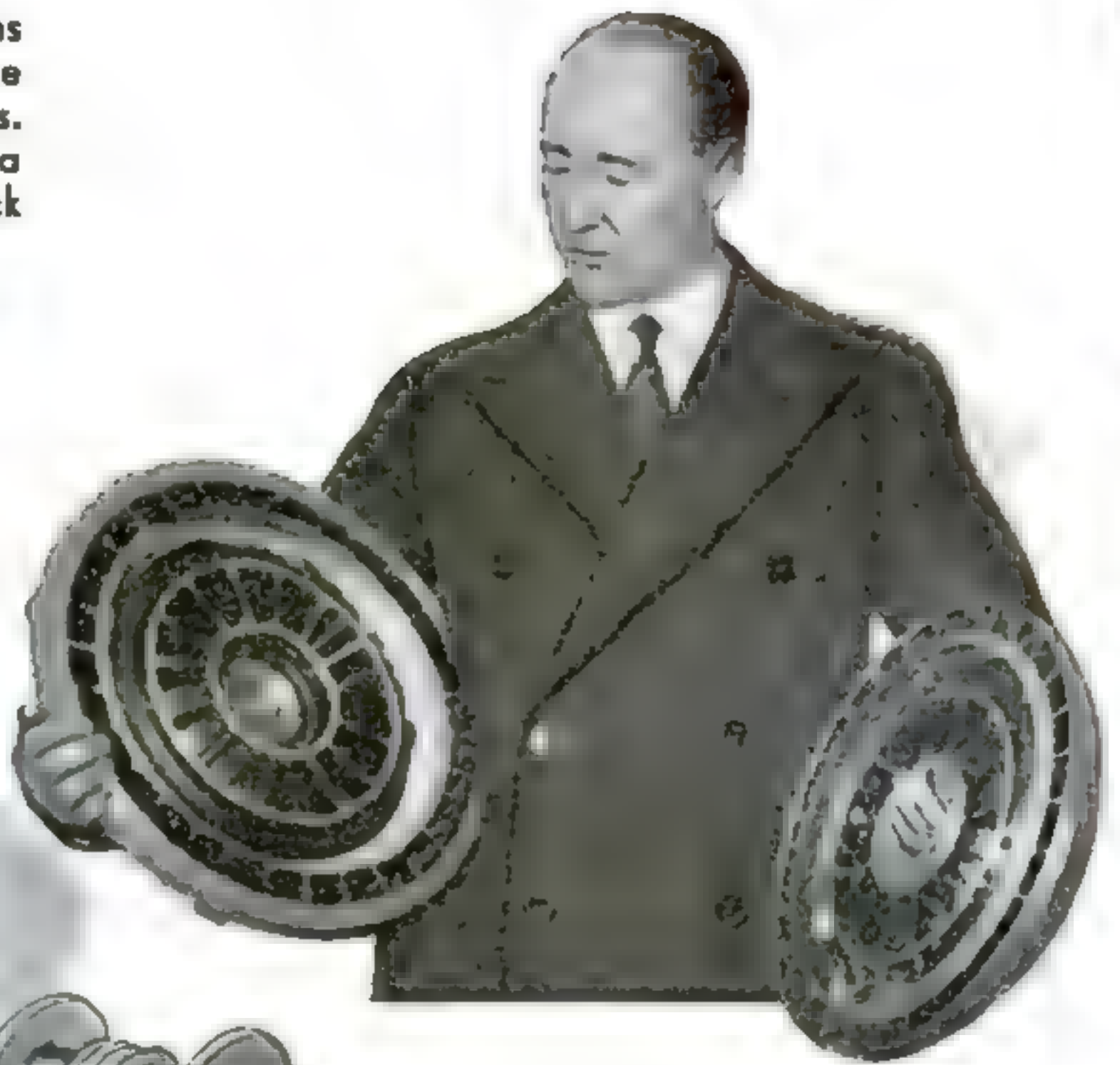
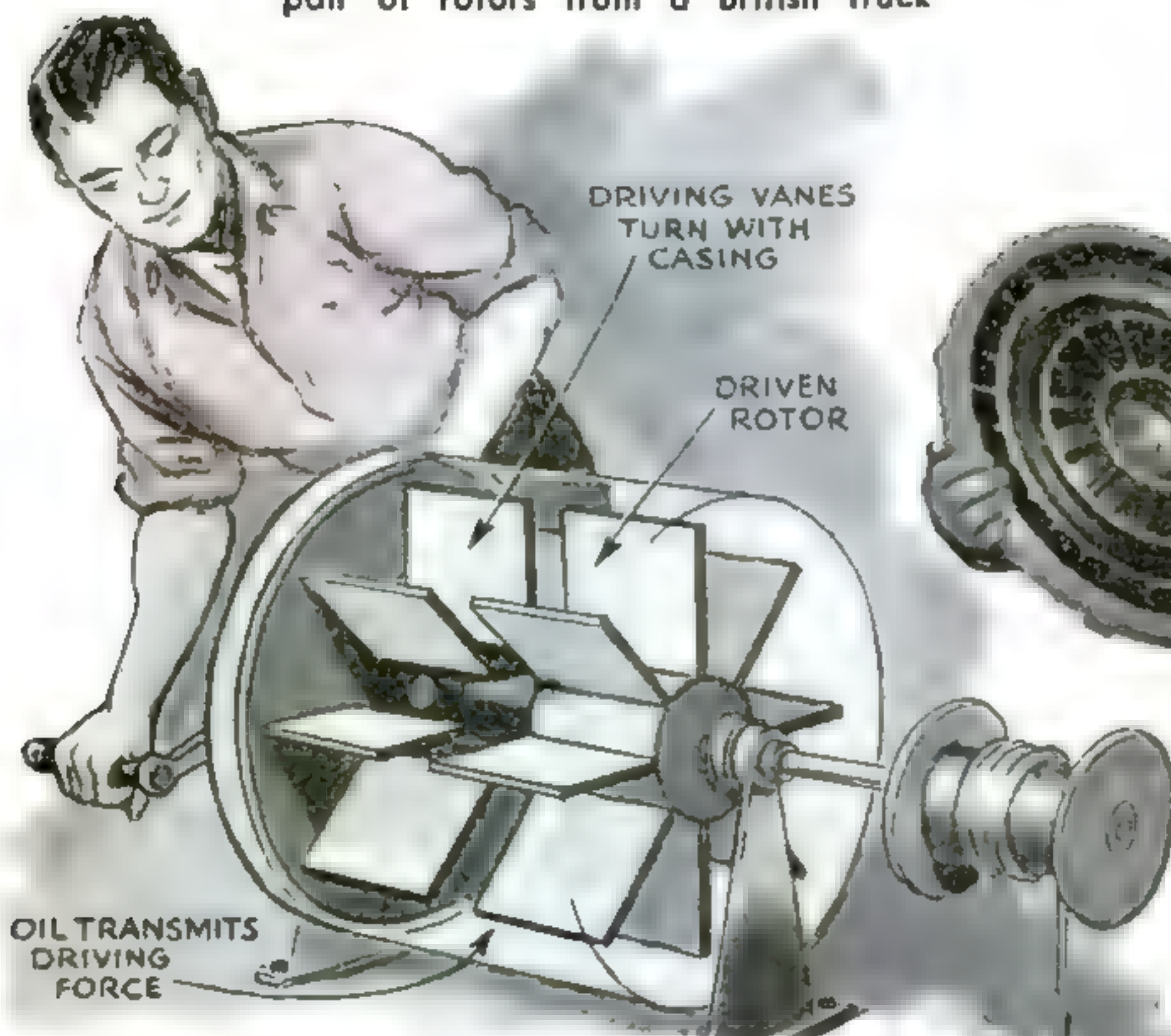
next step here, automotive experts believe.

New driving thrills are promised by the liquid clutch. When a car employs it, the driver has no gears to shift and no clutch pedal to work, for the device replaces both the standard gear box and the friction clutch. Simply step on the gas, and a standing car glides to full speed with a smoothness of acceleration that surpasses a motorist's dream.

By ALDEN P. ARMAGNAC

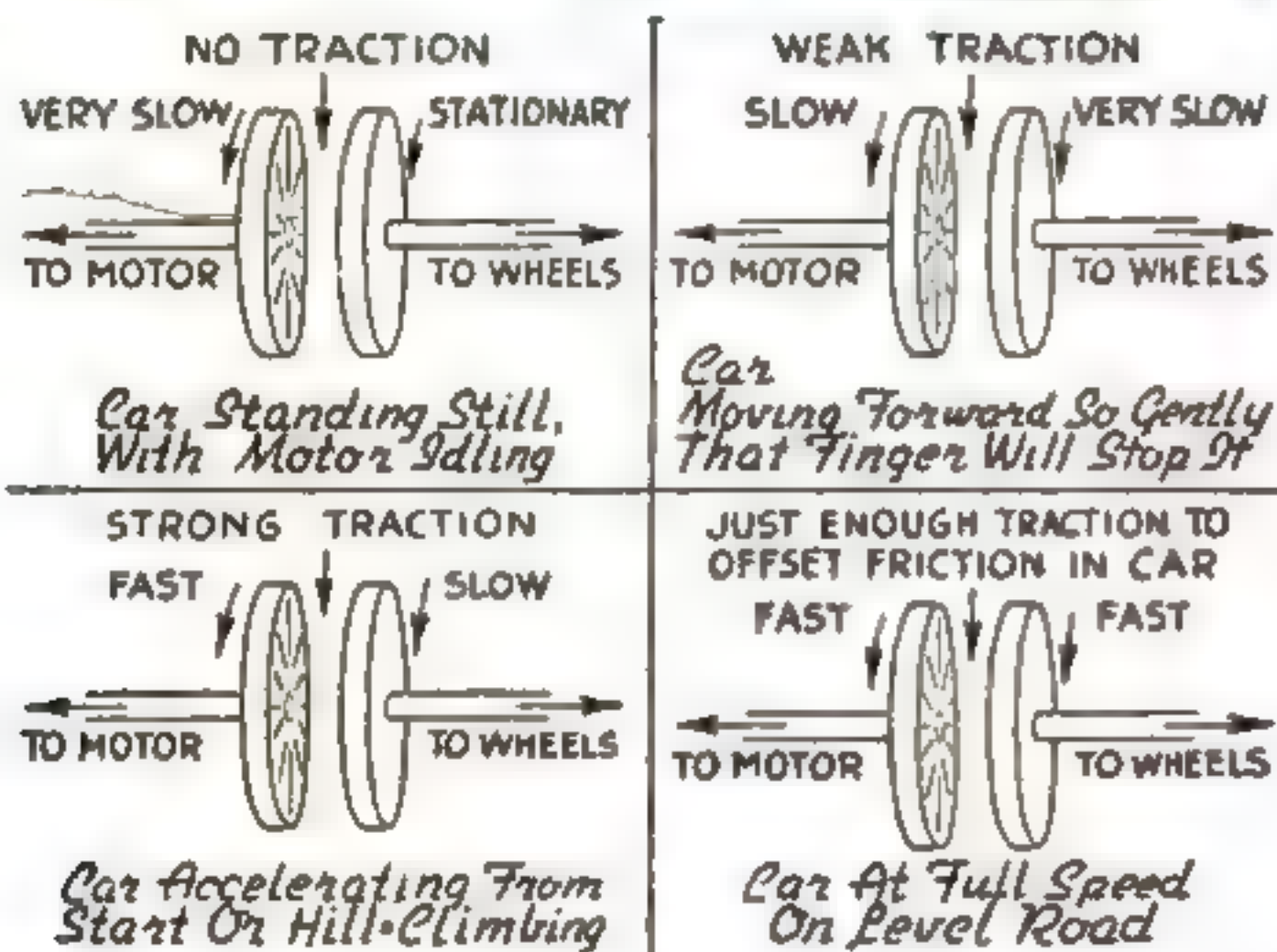
THIS IS HOW IT WORKS

The simplified drawing below explains the principle by which oil forms the physical connection between rotors. The man at the right is holding a pair of rotors from a British truck



wheels. Only when the operator pushes a special button to obtain direct drive between the motor and the wheels, as indicated in the drawing at the bottom of page 65, is there any actual connection between the two rotors in the clutch. Thus, noise and wear are reduced to a minimum.

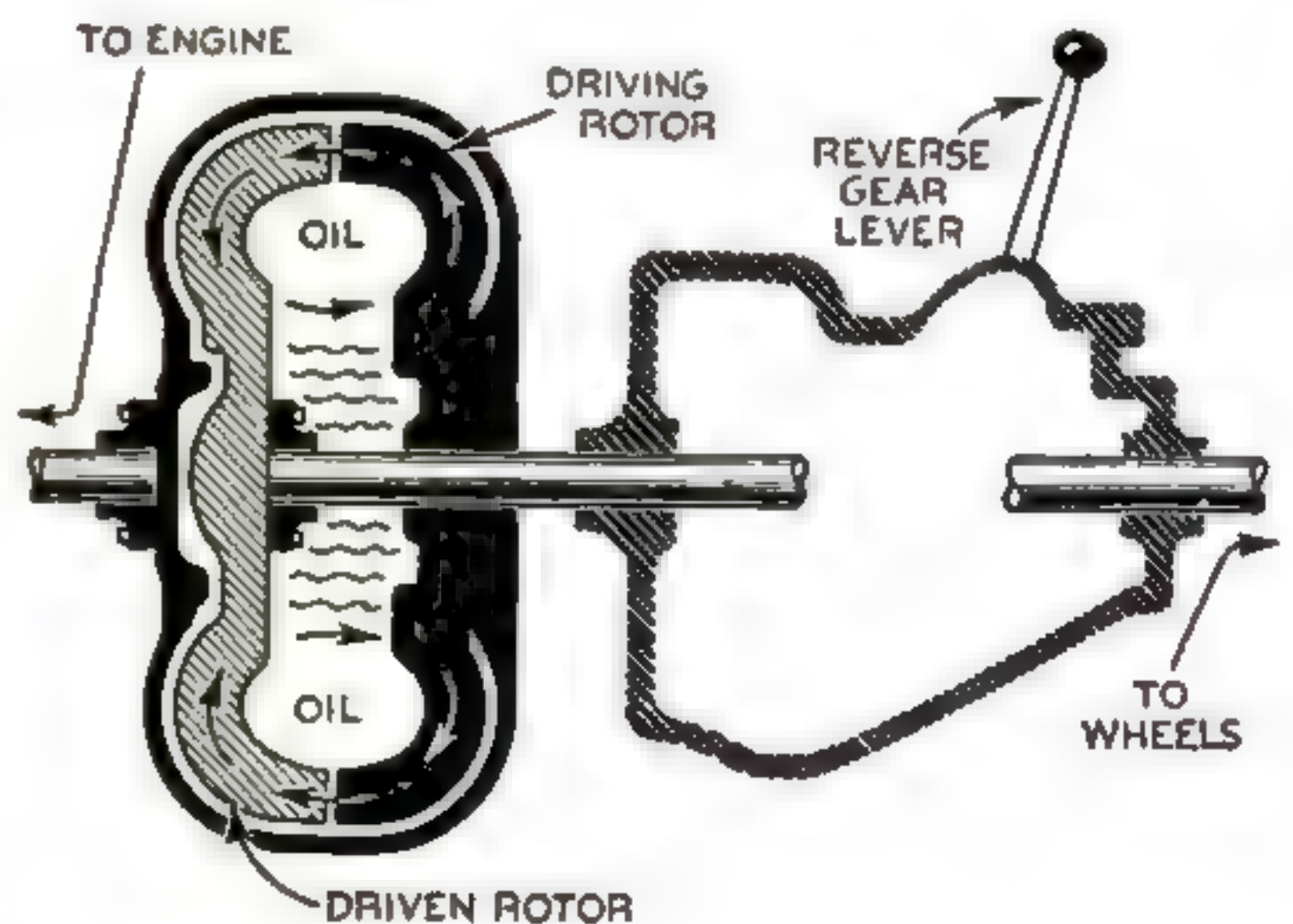
Because the oil provides the only physical connection between the two rotors, except when direct drive is used, some slipping is bound to occur—and that is exactly the essence of the liquid-clutch idea. Instead of jerking the car into motion with the full force of the engine, the device feeds power to the wheels just as it is needed. Slipping varies from a maximum, when the engine is idling, to almost zero when the engine is turning over at



Diagrams illustrate the respective action of the two rotors under various conditions met in driving

With the radical new invention, a driver can also perform strange, almost unbelievable feats. Depress the accelerator gently, and even a heavy bus can be set moving under such delicate control that you can stop it by pushing against it with one finger. But when you open the throttle wide, the car will hoist itself in slow motion over as formidable an obstacle as a heavy log placed in the path of the rear wheels.

How does the liquid clutch work? In its simplest form, it consists essentially of an oil-filled chamber in which two rotors revolve like paddle wheels. The engine drives one of them; this rotor draws along oil that impels the second rotor, which is connected to the



In England, where the liquid clutch has already been tried in private cars, it is designed like this

GEARLESS DRIVING FOR PLEASURE CARS

Below is a British pleasure car equipped with the liquid clutch. The lever is used only for reversing. Photograph at left shows the housing that contains the mechanism



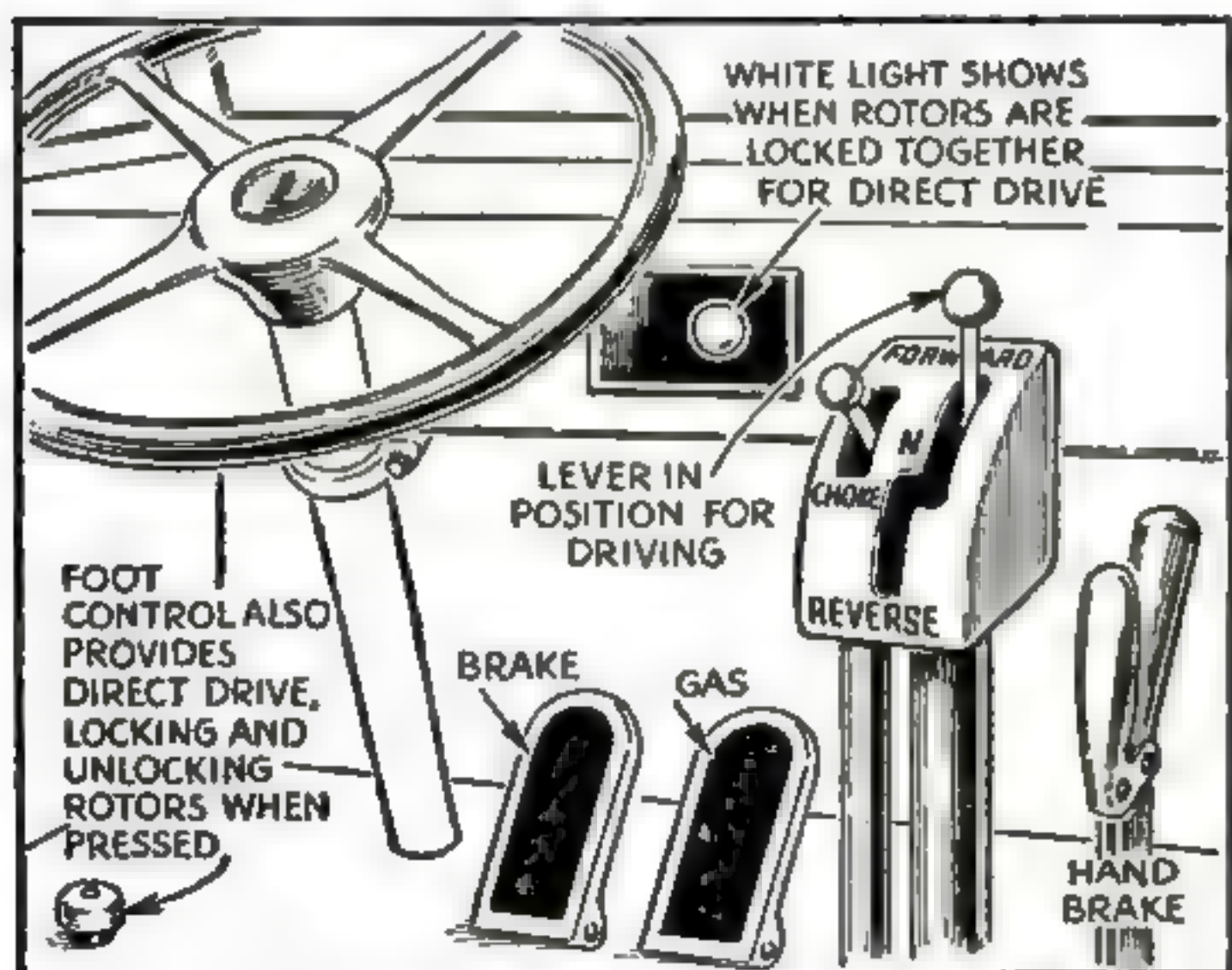
full speed. Thus, as the engine speeds up, the liquid clutch takes hold more firmly. The effect is like passing through higher and higher gears in rapid succession, with no perceptible jar or interruption in the smooth flow of power, as the car gets under way. Conversely, whenever the driver encounters an upgrade, the liquid clutch automatically adjusts itself to act like a lower gear of just the proper ratio, for anything from a gentle slope to a precipitous ascent. Here is the practical realization of an engineer's ideal—a transmission with not just three speeds forward, but what amounts to an infinite range of speeds to suit the road.

As early as 1929, a British experimenter, L. H. Pomeroy, demonstrated a car with a liquid clutch. One of England's leading automobile makers embodied the invention in a car placed on sale the following year. Later advances have culminated in a model re-

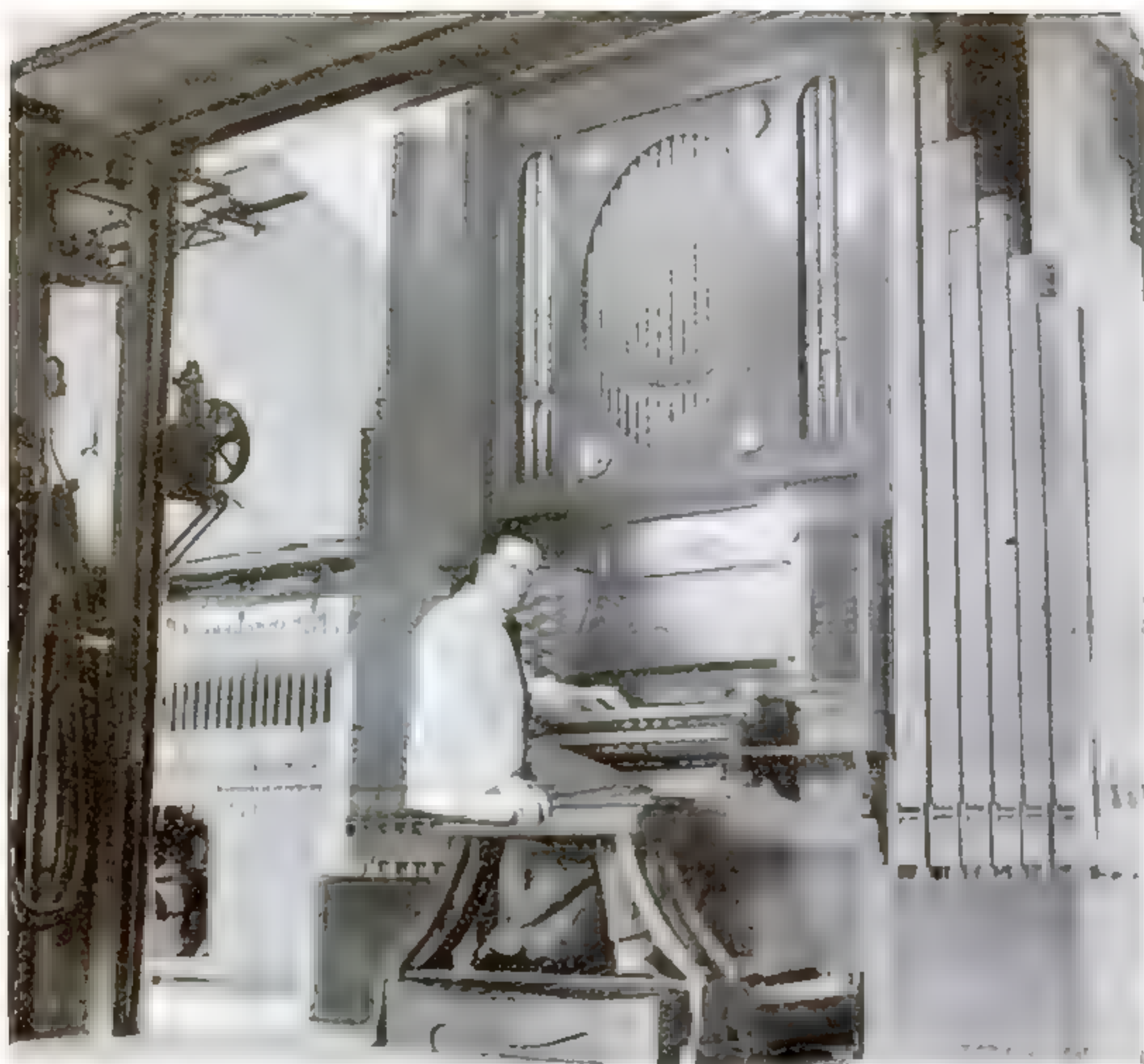
cently exhibited in Cambridge, England. Employing an improved form of liquid clutch devised by an Italian inventor, Salerni, it uses a gearshift lever only for putting a vehicle into reverse.

Meanwhile, it has just been revealed, a double-deck bus with a liquid clutch designed by General Motors engineers has been carrying passengers up and down New York City's Fifth Avenue for the past several months. Outwardly there is nothing to distinguish it from the rest of the green-painted busses that ply this route; and riders who marvel at the smoothness of "No. 2,124" might never suspect the real reason for its jerk-free operation. The compact gearless transmission lies hidden in the motor compartment at the rear. But a keen-eyed observer might notice that the nearest thing to a gearshift on the bus is a miniature hand lever with three positions labeled "forward," "neutral," and "reverse."

To take the bus out on a run, the driver moves the lever from neutral to forward position. He leaves it there all day, except when he uses the reverse position for backing. Starting and stopping with the gas pedal and brake alone, he is left free to concentrate all his attention upon safe driving in busy traffic. As one of the drivers declares, "It feels like a day off." And, one of these days, if the car makers in this country so decree, American motorists may have the opportunity to echo his sentiments.



Controls of an experimental gearless bus. The operator says that driving it is like a day off



Builds Organ of 550 Pipes in a Garage

USING his garage as a workshop, and giving only his spare time to the task, H. T. Adams, of Ham, Surrey, England, built the 550-pipe organ shown in the photograph at the left. Although Adams, an automotive engineer, had had no previous training in the work, he constructed every part of the twelve-foot-high organ himself, except the metal pipes. The only plans which he employed were those to guide him in assembling the intricate mechanism of the console.

H. T. Adams at the console of the pipe organ he constructed in his spare time

Canvas Basket Folds Up Flat



At the left, the canvas basket is being unfolded for use. Below, it is collapsed into a flat package for handy carrying

SHAPED like a market basket, a new collapsible shopping bag is also handy for fall picnics, football-game lunches, and other occasions. Sides of strong canvas are attached to a lightweight, folding metal bottom fitted with metal handles and hardwood grips. When not in use, the bag folds to a thickness of less than two inches. It carries loads of sixty-five pounds safely.



Head Band Keeps Sweat from Eyes

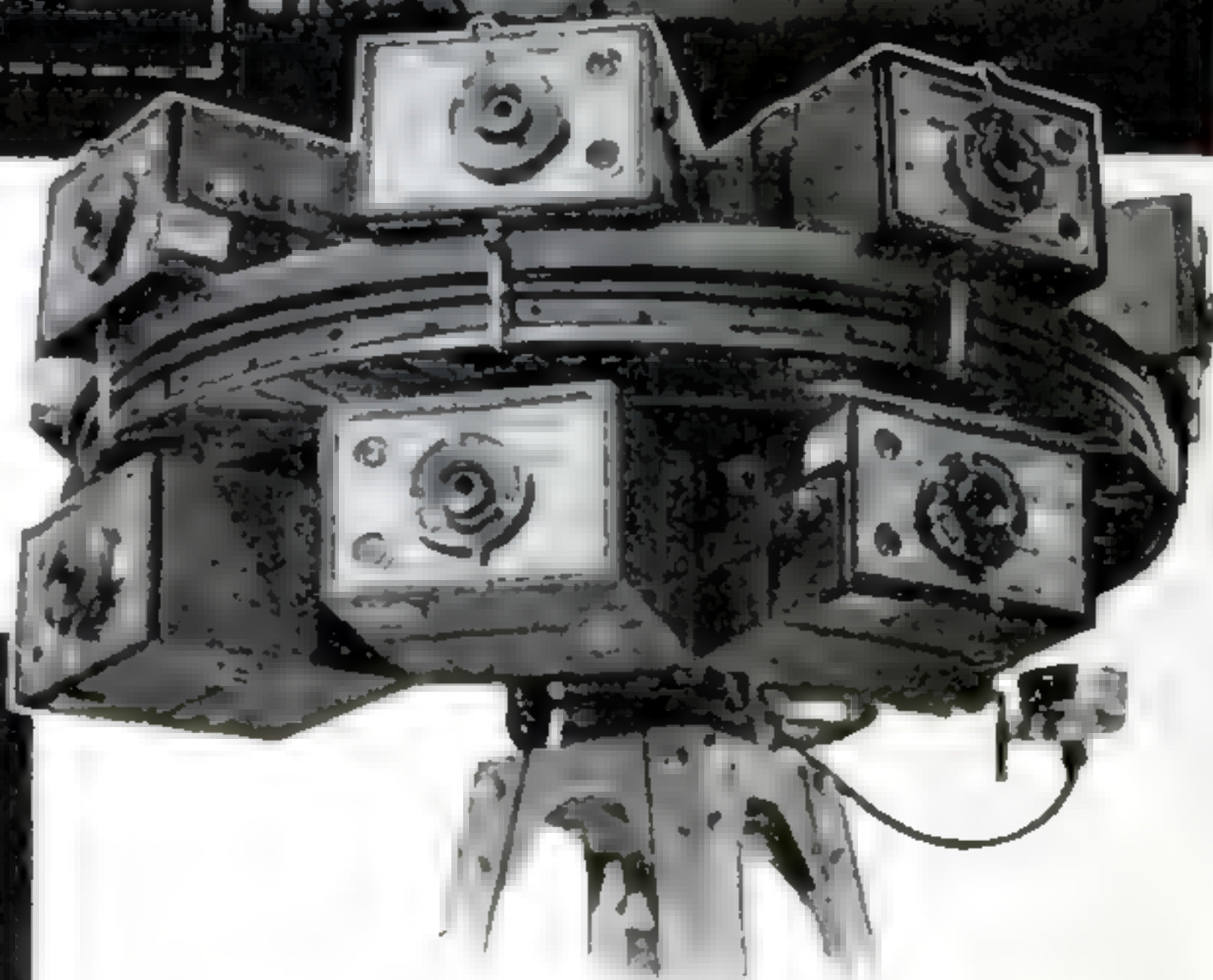
SURGEONS, welders, tennis players, and others should find an absorbent head band useful for preventing perspiration from running down into their eyes and obscuring their vision. Made of a cellulose material, the sweat band is held against the forehead by an elastic strap. It is said to absorb twenty times its weight in water.

How Lightning Strikes

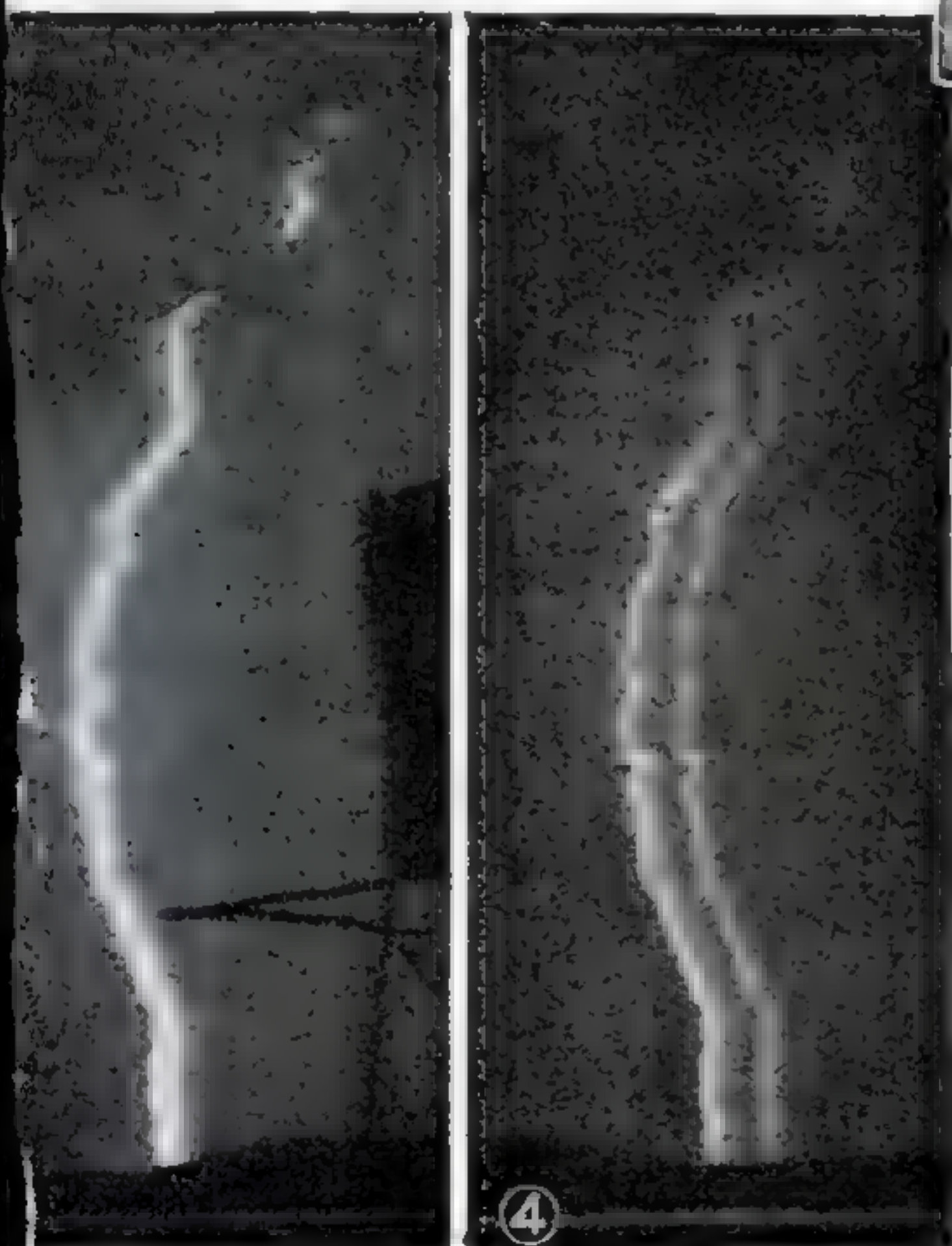
change of direction is indicated by the meeting of the two streaks in a V at the bottom.

3 Here the brightest flash of the series is traveling upward. It also was preceded by downward "leader" having much less brilliance.

4 The last of the flashes shows two streaks with no forks, and only one visible leader



The photos at the left cover the dotted-line area in the snapshot above made by one of the three fixed cameras mounted under the revolving cameras



by letting his finger strike projecting shutter triggers. When a lightning flash has occurred, he stops the wheel with the coaster brake, closes the shutters, and winds the films forward for another shot. Although the naked eye sees a stroke of lightning as a single flash, developed films from the whirligig cameras prove that each streak of lightning is in reality composed of a leader and several following strokes. Dr. Albright's studies tend to show that leader strokes travel from a cloud to the earth and main strokes in the opposite direction, and that in the earth-to-cloud flashes the cloud generally has a positive charge and the earth a negative one.

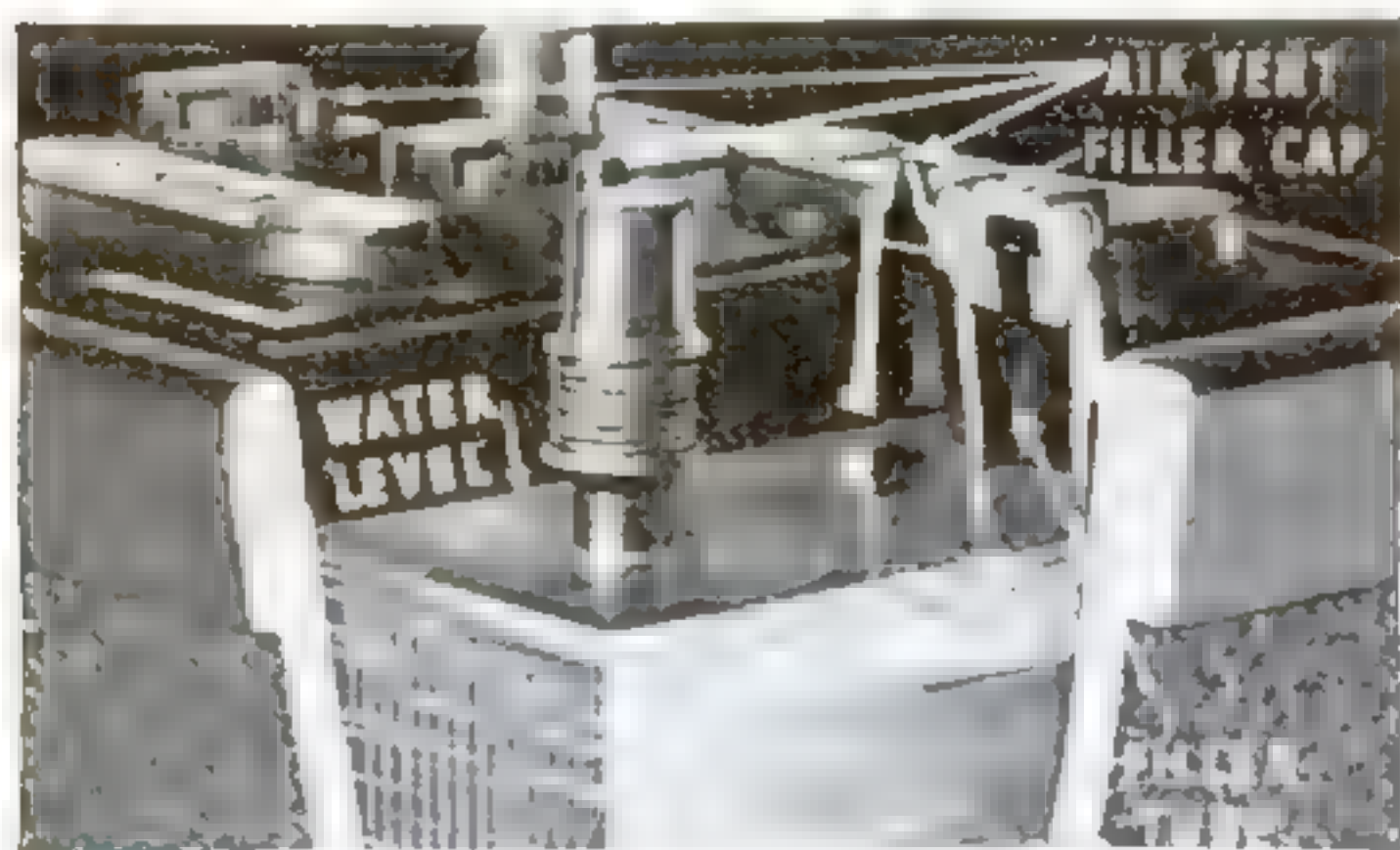
Inlaid Rubber Disks Mark Traffic Lanes



Workers installing the newly devised rubber traffic-lane markers in a heavily traveled street in Philadelphia, Pa.

HIGH visibility under all conditions is claimed for a new type of traffic marker invented by F. J. Farrel, of Conshohocken, Pa., and tried out recently in heavily traveled traffic lanes leading into Fairmount Park, Philadelphia, Pa. White in color, and made of a rubber-composition material, the new circular marker is said to be exceptionally durable and to possess nonskid properties. To place the markers in position in city streets, the asphalt pavement is first softened by means of a blowtorch playing on a circular area bounded by a rim of metal. The circle of melted asphalt is then removed with a cutter, hot tar is poured in as a binding agent, and the rubber marker set and tamped into place. Proponents of the new markers claim that they will eventually replace the white painted traffic strips on highways throughout the country, pointing out that the markers will last for many years.

Hot tar is used as a binder to hold the disks in place



Battery cut away to show filler pipe and air vent

Battery Can't Be Overfilled

OVERFILLING the cells of an automobile battery with distilled water can decrease its efficiency markedly by weakening the acid solution. To prevent this, a 1939-model automobile has a battery which it is impossible to overfill. When water is poured into the filler tube of a cell, the level of the liquid rises to a point where it blocks off the air vent, thus preventing the introduction of more water. This point is the correct water level for maximum battery efficiency.



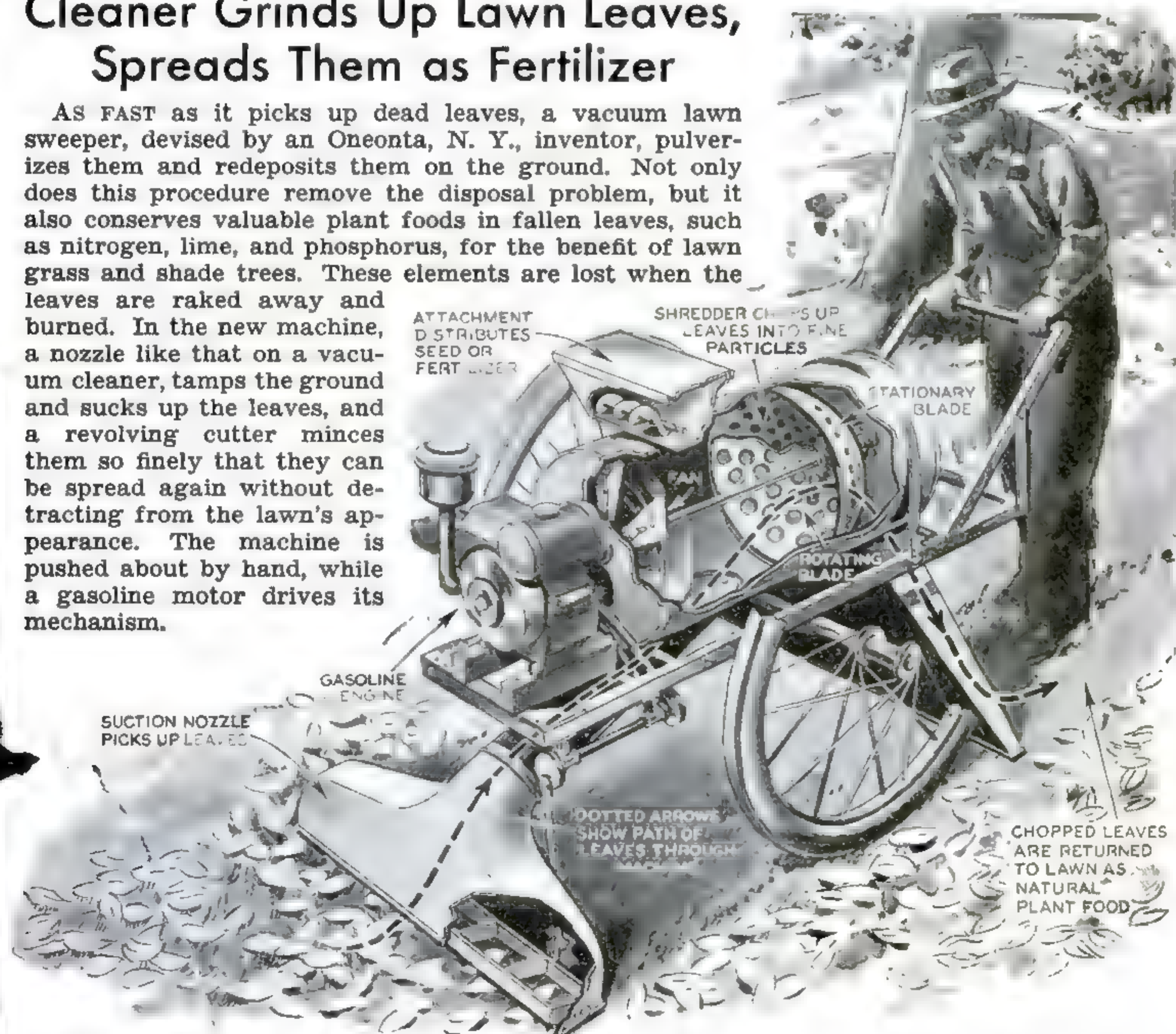
First sidewalk television interview, as it took place recently in New York

Sidewalk Chats Are Televised

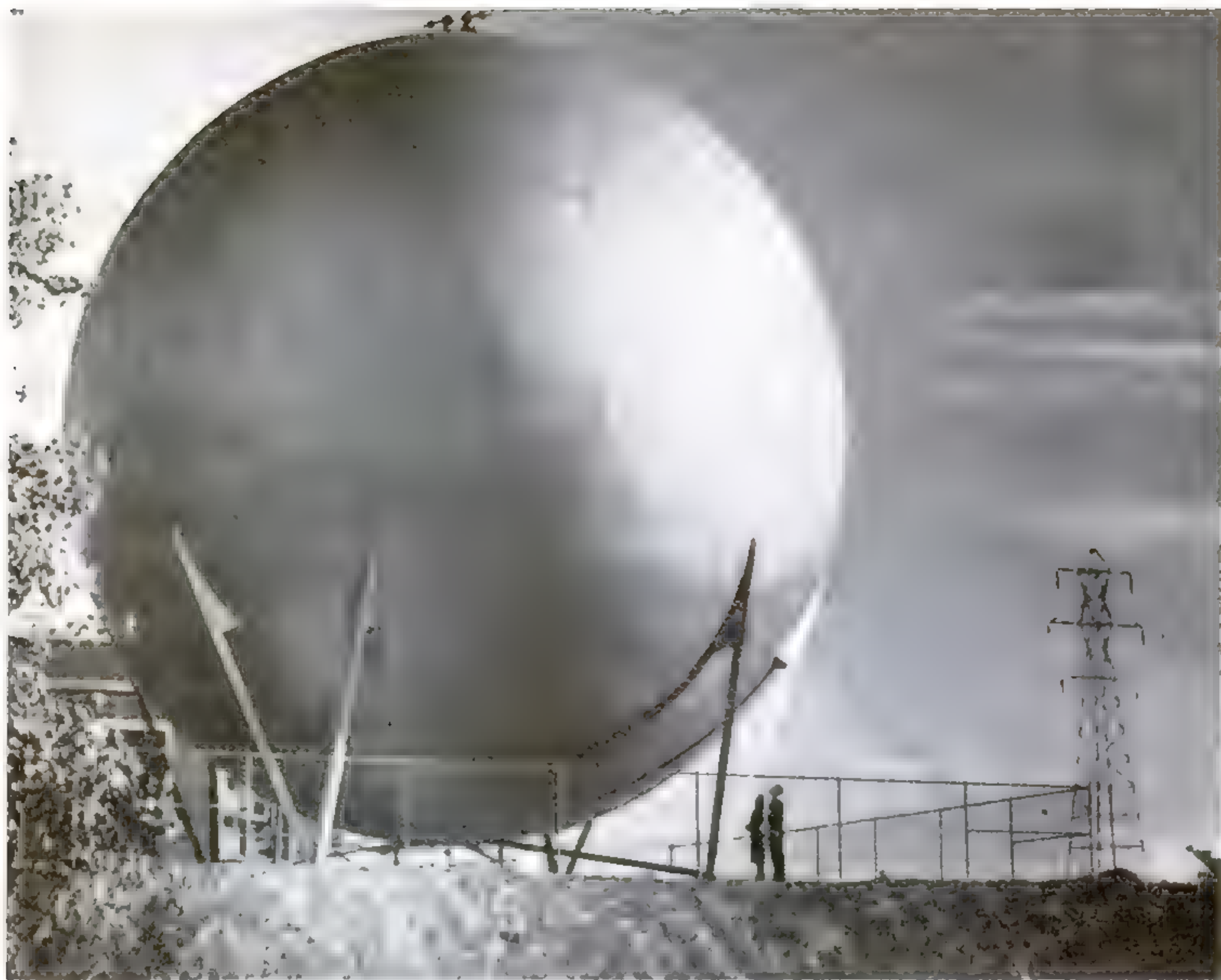
PASSERS-BY in New York City recently were interviewed on their tastes in television programs, while experimenters at sight-and-sound receivers watched them and heard their comments. A television camera was set up on the sidewalk for the experiment. N. B. C. engineers called the test the first scheduled outdoor program in their current series of experimental television broadcasts from the tower of the Empire State Building.

Cleaner Grinds Up Lawn Leaves, Spreads Them as Fertilizer

AS FAST as it picks up dead leaves, a vacuum lawn sweeper, devised by an Oneonta, N. Y., inventor, pulverizes them and redeposits them on the ground. Not only does this procedure remove the disposal problem, but it also conserves valuable plant foods in fallen leaves, such as nitrogen, lime, and phosphorus, for the benefit of lawn grass and shade trees. These elements are lost when the leaves are raked away and burned. In the new machine, a nozzle like that on a vacuum cleaner, tamps the ground and sucks up the leaves, and a revolving cutter minces them so finely that they can be spread again without detracting from the lawn's appearance. The machine is pushed about by hand, while a gasoline motor drives its mechanism.



Leaves sucked up by this cleaner pass through a whirling pulverizer and back to a lawn to fertilize it



Arc-Welded Gas Tank Resembles A Giant Bubble

RESEMBLING a giant bubble supported on the heads of mammoth arrows stuck into the ground, the huge metal sphere pictured above is used as a storage tank for surplus combustible gases generated by the decompo-

sition of sewage in a new disposal plant in Cleveland, Ohio. More than fifty-seven feet in diameter, the gas globe was constructed by an arc-welding process from steel plates that had previously been cut and curved.

Swimmer Eats While Floating

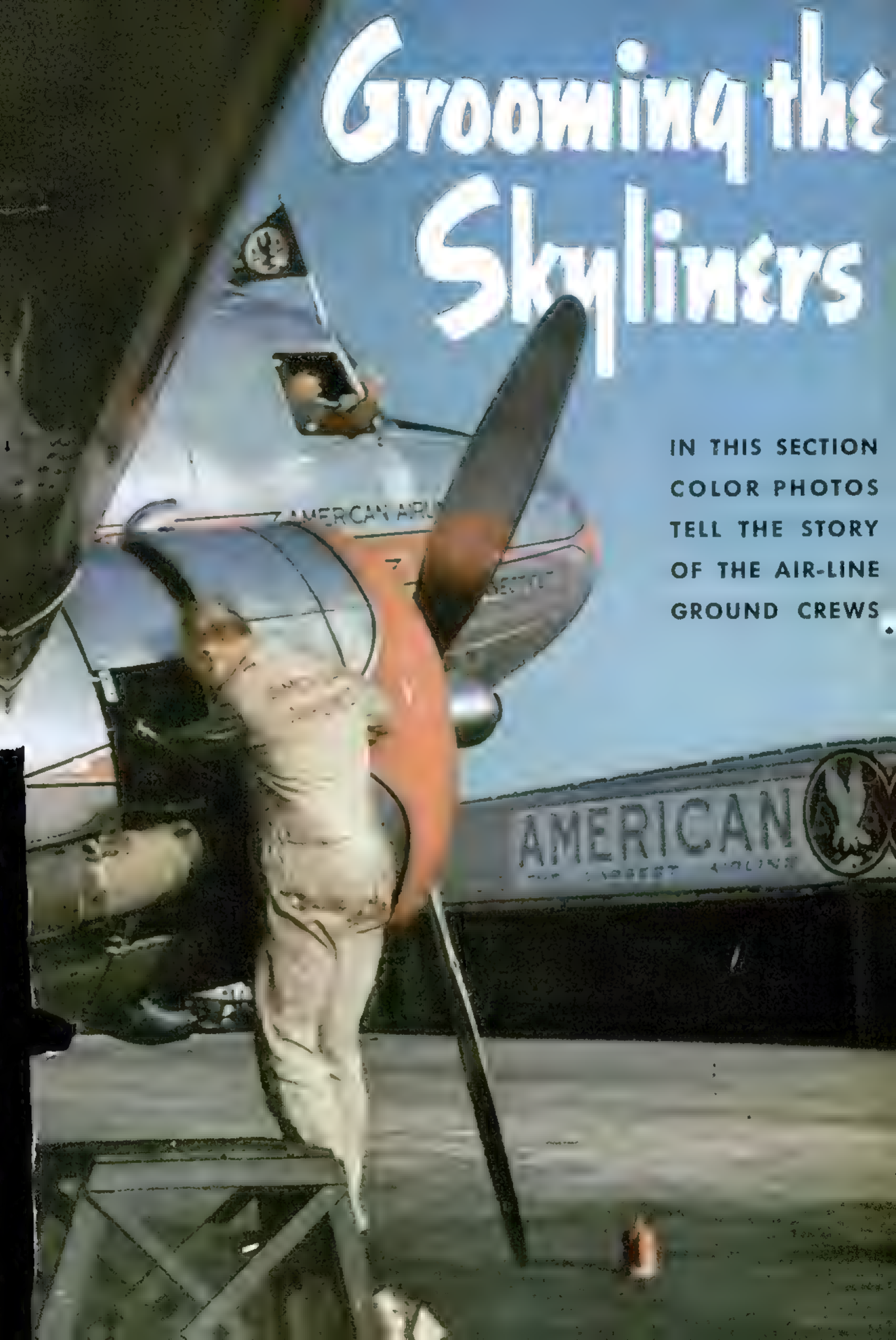
IN TRAINING for a projected long-distance swim from Atlantic City, N. J., to the water-front site of the World's Fair in New York City, Norris Kellam, 381-pound endurance swimmer, is shown at the right practicing the technique of eating while floating on his back. During his swim, Kellam plans to lunch once every two hours.



When Kellam wants a drink, a twitch of his chest tips the bottle to his mouth

Grooming the Skyliners

IN THIS SECTION
COLOR PHOTOS
TELL THE STORY
OF THE AIR-LINE
GROUND CREWS.



IT TAKES ONLY ONE MAN TO FLY A MODERN AIRLINER, MEN ARE REQUIRED FOR THE GROUND CREWS AND SHOP



Master mechanics reassembling a 1,100-horsepower Wright Cyclone engine after a complete overhauling. It is then tried out on a test block

By EDWIN TEALE

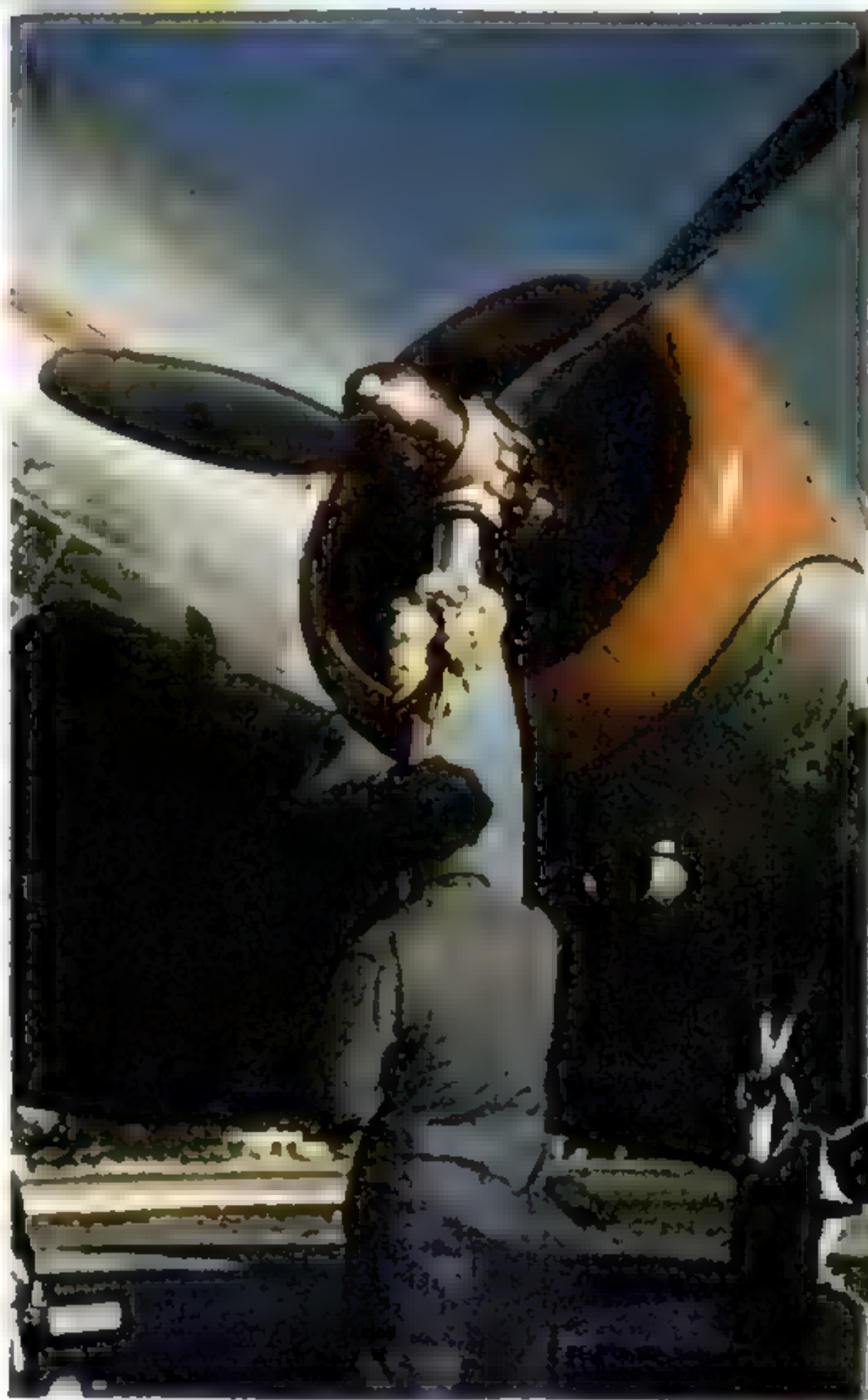
ITS huge, silver body glinting in the floodlights, a skyliner rolls to a stop at an Eastern airport. Twelve hours later, it soars off into the sunshine on another scheduled run. In the meantime, a score or more of white-clad experts have worked with swift and smooth efficiency, cleaning, grooming, and inspecting the great metal machine. It takes only one man to fly a modern airliner; but it takes an average of twenty-five men on the ground to keep it in the air.

No sooner does one of the trim Douglas planes used by the transcontinental air lines swing into position after a run than members of the ground crew swarm around it. Ladder platforms, rolling on rubber-tired wheels, move up beside the two great engines. Crack mechanics climb to the top and begin a methodical check-up that takes them from an hour and a half to two hours to complete. They turn over the propellers to study the compression of the cylinders; they examine every part and fitting; they search for sediment in gasoline and oil tanks; they remove each spark plug and measure the gap with instruments that reveal if it is as much as one ten-thousandth of an inch more or less than it should be.

While this is going on, a gang of mechanics

begin scrubbing the big plane with soap and water. After every flight, the ninety-five-foot wings and the sixty-five-foot body are lathered, rinsed, and dried. Window-cleaning brushes apply the liquid soap, hoses wash it off, and special wedge-shaped mops of soft cotton dry and polish the metal. From sixteen to eighteen men work upwards of eight hours to give a modern airliner its bath.

Inside the ship, two highly trained inspectors are busy going over every nut and bolt. Starting at the nose, they



Here a mop is being used to polish one of the three blades of a propeller. It takes eighteen men more than eight hours to give one of these planes a bath

stubborn patches of carbon are found in cylinders, they are scoured off in a sand-blasting machine which drives the quartz particles across the metal with terrific force.

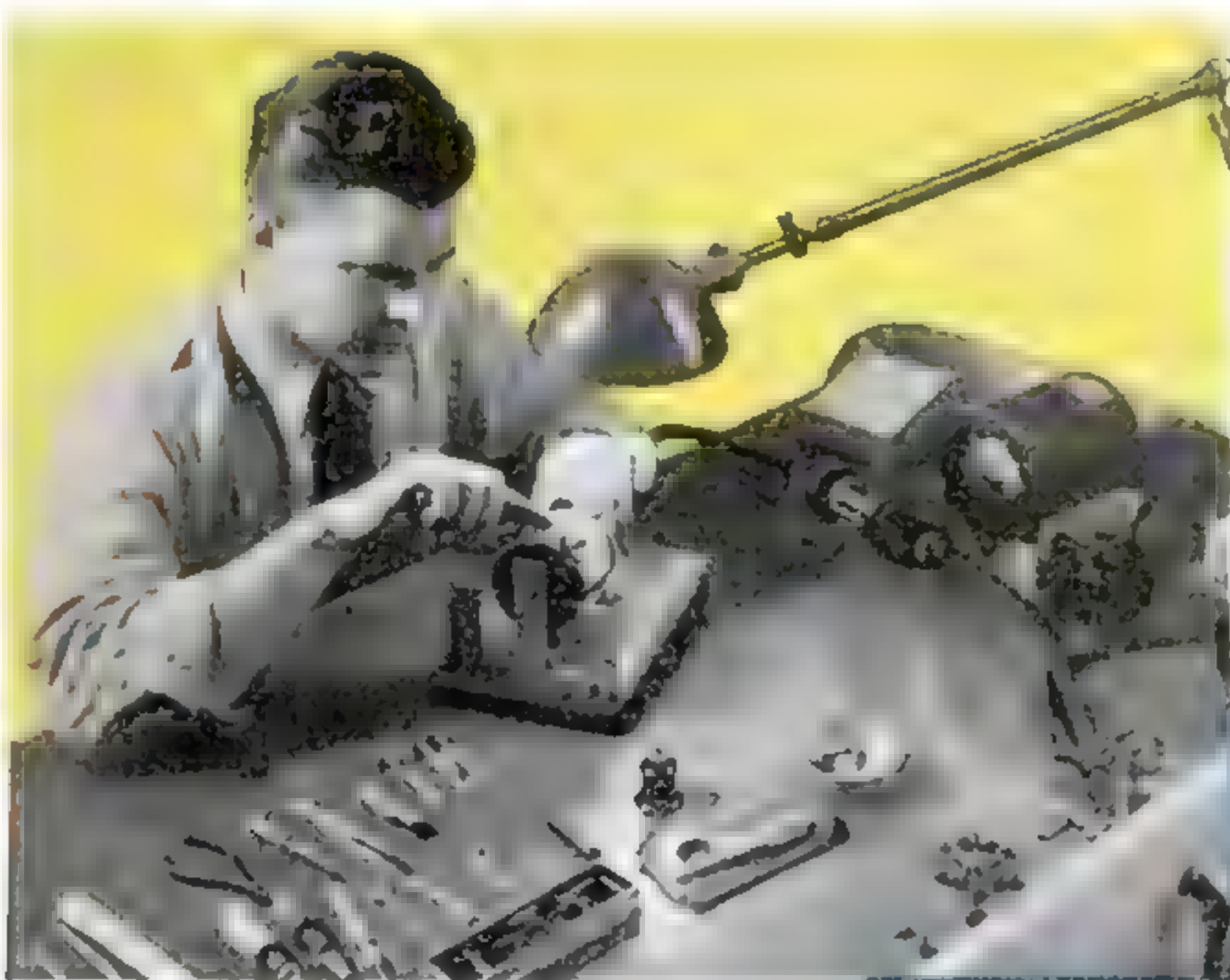
After the parts have been cleaned, they pass before inspectors using microscopes in their search for tiny flaws. Even this is not enough. There may be internal cracks invisible to the microscope. So each part is subjected to an ingenious magnetic method of testing. After being electrically magnetized, it is dropped into a kerosene bath containing millions of tiny particles of iron. When the metal part is magnetized, opposite sides of an internal crack take on the characteristics of opposite poles of a magnet. The flaw, in effect, becomes a tiny horseshoe magnet attracting the iron filings to it. When a cluster of iron particles is found on the outside of any part, it is instantly discarded. Those with-

out flaws are demagnetized and cleaned. Propeller hubs and other vital parts of the plane which are made of steel are similarly inspected.

At the great T.W.A. shops at Kansas City, Mo., a corps of skilled mechanics can tear down, clean, inspect, and reassemble an average of two engines a day. After the motor has been put together again, it is broken in like a new automobile, running on a test block for hours at gradually increasing speeds. Every part that goes into every engine has its number and a record is kept of the time when the individual valves and pistons, rings and bolts are installed. At any moment, the men in charge of the air-line power plants can tell how much service each part has seen.

Similar records are kept of the parts of the plane itself. As many as 350 men may be engaged in the intensive work of giving the plane and its power plants the 500-

hour overhaul. Such skilled ground crews form the foundation of air-line safety. It was their work which enabled American air-transport companies, last year, to set an amazing record. For every passenger fatality in 1937, the planes covered 10,000,000 passenger miles—equivalent to 400 flights around the equator or forty trips to the Moon!



FIRST AID FOR THE PILOT

Navigating instruments come in for a careful inspection. Here the artificial horizon is open for examination as a part of the 500-hour overhaul

Color photos courtesy American Airlines and Transcontinental and Western Airlines

—AND HAPPY LANDING

Passengers boarding a plane for a transcontinental flight. Back of the luxury and safety of the skyliner of today is the expert, methodical work of the ground crews which form the foundation of air transport



stubborn patches of carbon are found in cylinders, they are scoured off in a sand-blasting machine which drives the quartz particles across the metal with terrific force.

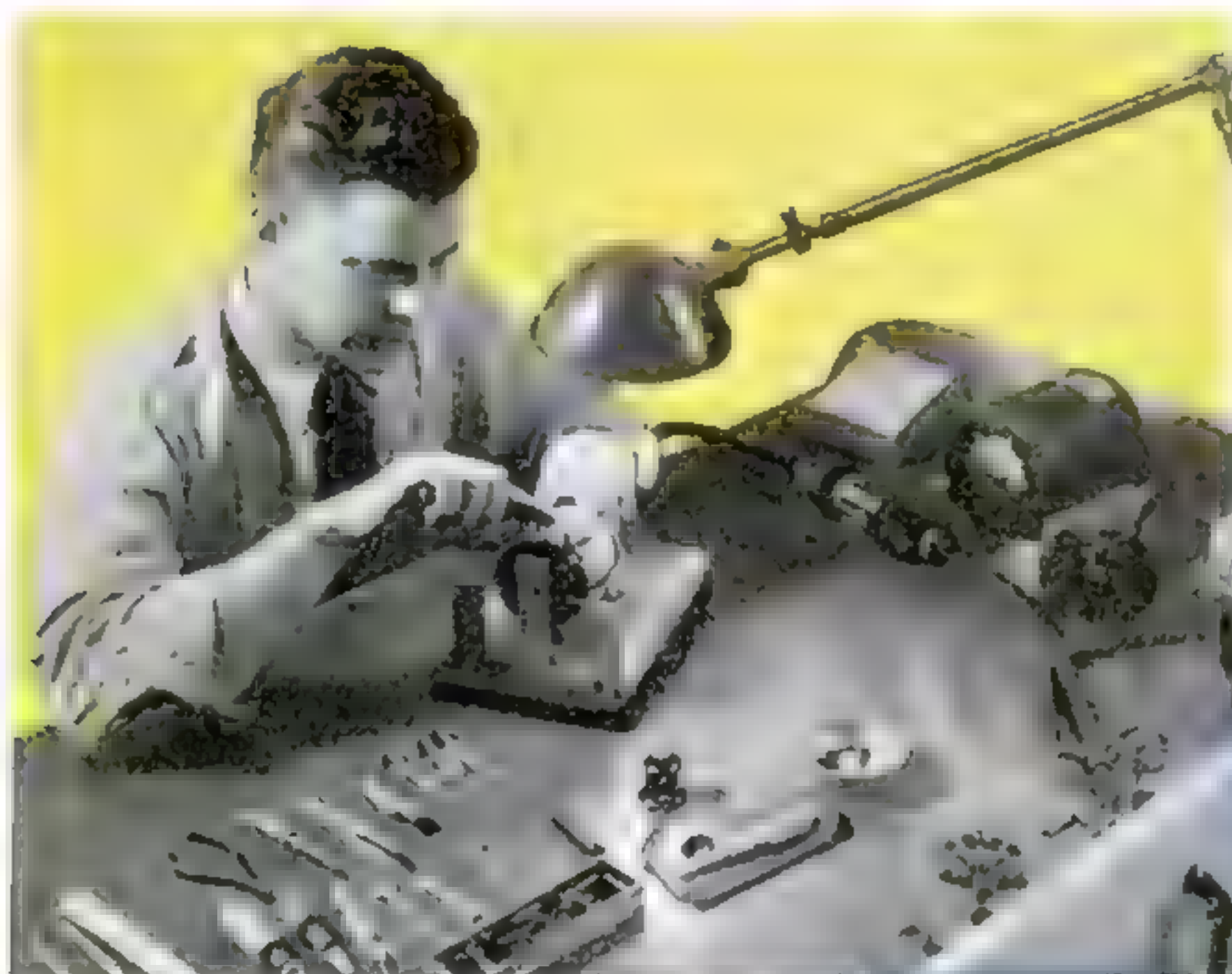
After the parts have been cleaned, they pass before inspectors using microscopes in their search for tiny flaws. Even this is not enough. There may be internal cracks invisible to the microscope. So each part is subjected to an ingenious magnetic method of testing. After being electrically magnetized, it is dropped into a kerosene bath containing millions of tiny particles of iron. When the metal part is magnetized, opposite sides of an internal crack take on the characteristics of opposite poles of a magnet. The flaw, in effect, becomes a tiny horseshoe magnet attracting the iron filings to it. When a cluster of iron particles is found on the outside of any part, it is instantly discarded. Those with-

out flaws are demagnetized and cleaned. Propeller hubs and other vital parts of the plane which are made of steel are similarly inspected.

At the great T.W.A. shops at Kansas City, Mo., a corps of skilled mechanics can tear down, clean, inspect, and reassemble an average of two engines a day. After the motor has been put together again, it is broken in like a new automobile, running on a test block for hours at gradually increasing speeds. Every part that goes into every engine has its number and a record is kept of the time when the individual valves and pistons, rings and bolts are installed. At any moment, the men in charge of the air-line power plants can tell how much service each part has seen.

Similar records are kept of the parts of the plane itself. As many as 350 men may be engaged in the intensive work of giving the plane and its power plants the 500-

hour overhaul. Such skilled ground crews form the foundation of air-line safety. It was their work which enabled American air-transport companies, last year, to set an amazing record. For every passenger fatality in 1937, the planes covered 10,000,000 passenger miles—equivalent to 400 flights around the equator or forty trips to the Moon!



FIRST AID FOR THE PILOT

Navigating instruments come in for a careful inspection. Here the artificial horizon is open for examination as a part of the 500-hour overhaul

Color photos courtesy American Airlines and Transcontinental and Western Airlines

—AND HAPPY LANDING

Passengers boarding a plane for a transcontinental flight. Back of the luxury and safety of the skyliner of today is the expert, methodical work of the ground crews which form the foundation of air transport



BUT AN AVERAGE OF TWENTY-FIVE STAFFS THAT KEEP IT IN THE AIR

work backward toward the tail. Nearly half a working day is consumed in that journey of sixty-five feet. Each man checks off the items he is responsible for inspecting: instruments, control wires, seat belts, landing gear, heating pipes, seats, aileron fittings, and so on down the list. Batteries, which were pulled out of the ship as soon as the check-up started, have been clamped to a recharging bench. Only an hour or so before the take-off will they be reinstalled, charged to capacity. During the time the big ship is on the ground, radio experts test its wireless equipment, trying it out on all frequencies used in the air.

The coming of winter brings additional duties for the men who groom the skyliners. They install and inspect the de-icing boots—rubber envelopes running along the leading edges of the wings and tail surfaces, which can be expanded to break off forming sleet. The cabins of many planes are air-conditioned before the take-off. Warm air is pumped in through special filters during the months of cold, cooled air during the summer.

This daily routine, thorough as it is, seems mild compared to the grueling tests that each ship gets at the end of 100 and 500 hours in the air. The latter figure represents about 100,000 miles of travel. For the exhaustive examination which follows, the plane goes to one of the big shops on the line.

These sky-railway "roundhouses" are equipped with every



Man maintains
owes its s



SPLIT-SECOND SERVICE KEEPS THEM FLYING

With the precision of a well-drilled military unit, the ground crew swarms over the plane the instant it comes to a halt in front of the airport station for a brief scheduled stop.

BUT AN AVERAGE OF TWENTY-FIVE STAFFS THAT KEEP IT IN THE AIR

work backward toward the tail. Nearly half a working day is consumed in that journey of sixty-five feet. Each man checks off the items he is responsible for inspecting: instruments, control wires, seat belts, landing gear, heating pipes, seats, aileron fittings, and so on down the list. Batteries, which were pulled out of the ship as soon as the check-up started, have been clamped to a recharging bench. Only an hour or so before the take-off will they be reinstalled, charged to capacity. During the time the big ship is on the ground, radio experts test its wireless equipment, trying it out on all frequencies used in the air.

The coming of winter brings additional duties for the men who groom the skyliners. They install and inspect the de-icing boots—rubber envelopes running along the leading edges of the wings and tail surfaces, which can be expanded to break off forming sleet. The cabins of many planes are air-conditioned before the take-off. Warm air is pumped in through special filters during the months of cold, cooled air during the summer.

This daily routine, thorough as it is, seems mild compared to the grueling tests that each ship gets at the end of 100 and 500 hours in the air. The latter figure represents about 100,000 miles of travel. For the exhaustive examination which follows, the plane goes to one of the big shops on the line.

These sky-railway "roundhouses" are equipped with every



Man makes
owes its s



SPLIT-SECOND SERVICE KEEPS THEM FLYING

With the precision of a well-drilled military unit, the ground crew swarms over the plane the instant it comes to a halt in front of the airport station for a brief scheduled stop.

Home-Built Car Hits 130-Mile Speed



POLICE may object to the fact that the car that Mylio Ozuk, Chicago high-school student, has built himself has neither license tags nor headlights—but they'll have to catch him first. And that may not be an easy task, for the proud builder claims that his extraordinary creation can attain the speed of 130 miles an hour. Modeling it after some of the most advanced designs that have been proposed for motor cars, he has placed the motor and radiator to the rear of the driver's seat so that he will have a clear and unobstructed view for fast driving. In the picture above, the streamline exterior surface of the car has been removed.

Rays Kill Pup's Fleas



FIDO'S worries about fleas are over, according to the maker of a new electric insect exterminator, when the device is turned upon the animal. The infra-red rays that it generates are said to be death to a wide variety of parasites, as well as to their eggs and larvae.

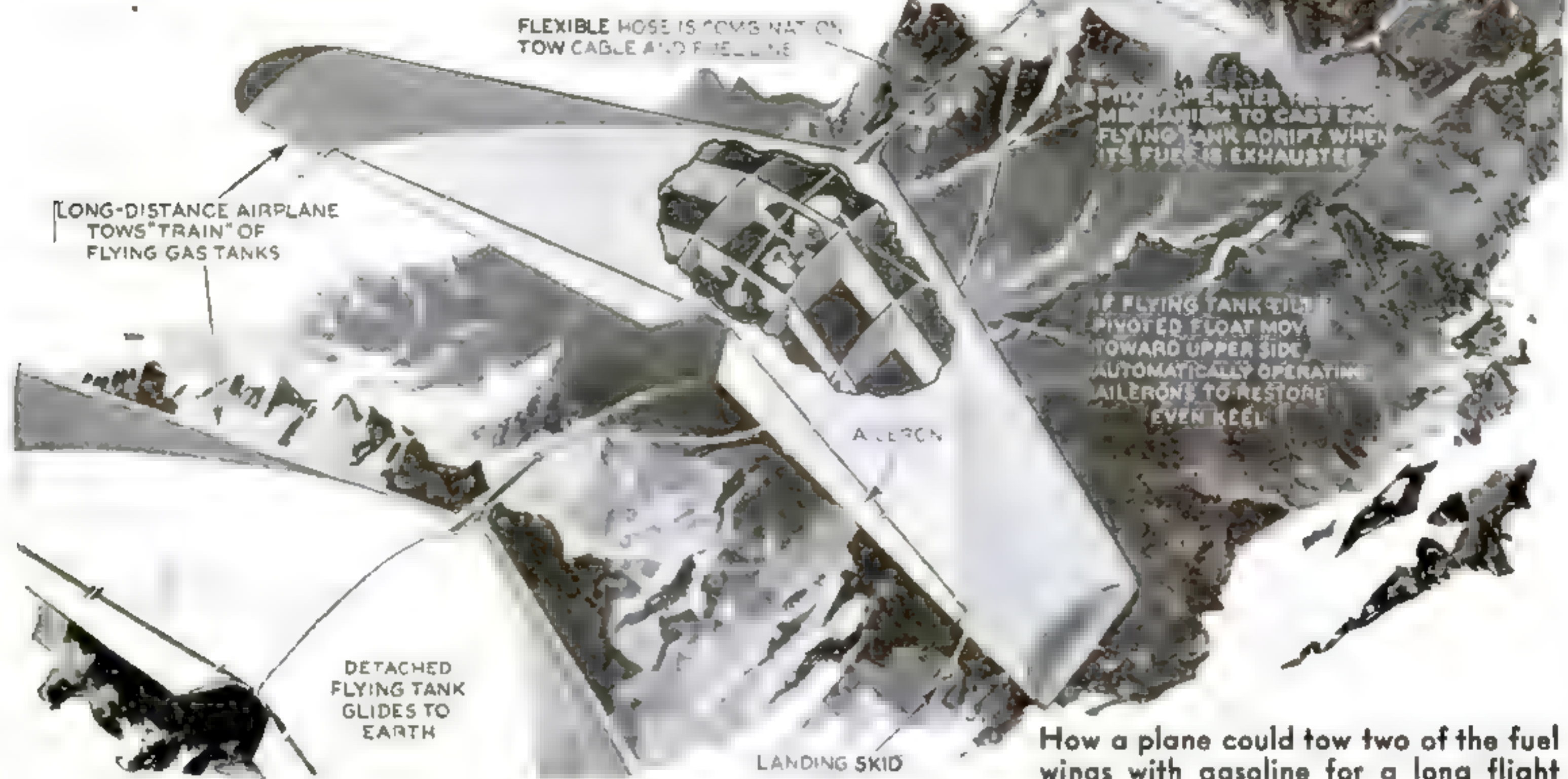


New Radio-Operated Compass

PLANES, tanks, ships, and torpedoes may be remotely controlled, and their positions shown at all times on a map, with the aid of an improved radio compass devised by Warren S. Eaton, noted aeronautical engineer. Shown above during a test, it also offers an airplane pilot all the information necessary for accurate blind flying to a destination. For this purpose, the inventor maintains that it has the advantages of being unaffected by static, and of finding the direction of a ground radio station with no "fore-or-aft" uncertainty as to which of two diametrically opposite directions the waves are coming from.

Trailers for Planes Carry Extra Fuel

TO INCREASE the cruising range of airplanes on long-distance flights, John Akerman, Chicago, Ill., inventor, proposes the novel flying gas tanks pictured in the drawing. The curious fuel wings, divided into a number of cells and provided with an automatic, float-operated mechanism that keeps



them level, are towed behind an airplane by means of strong, hollow tubes that also serve as connecting fuel lines. During the take-off, the gas wings ride on wheeled undercarriages until they reach flying speed. When one of

the tanks becomes empty during a long flight, it is detached from the fuel train by a special release mechanism, and glides to the ground where it can be retrieved, returned to the airport, and used over again.



Moistened, the tip of the "match" is touched to the run

Match-Book Glue Sticks Stop Stocking Runs

RUNS in women's silk stockings can be quickly and effectively stemmed with a novel accessory just placed on the market. Bound in small booklets like the paper matches supplied to smokers, a dozen cardboard sticks, each shaped to resemble a stocking, are coated at the tips with a special solution of glue. When a stocking run occurs, one of the sticks is torn out of the booklet, moistened at the tip by touching it to the tongue, and then applied to the run. The glue, softened by moisture, binds the threads of the stocking to prevent the run from spreading. Because of their compactness, the "run stoppers" can be conveniently carried in a purse or handbag.

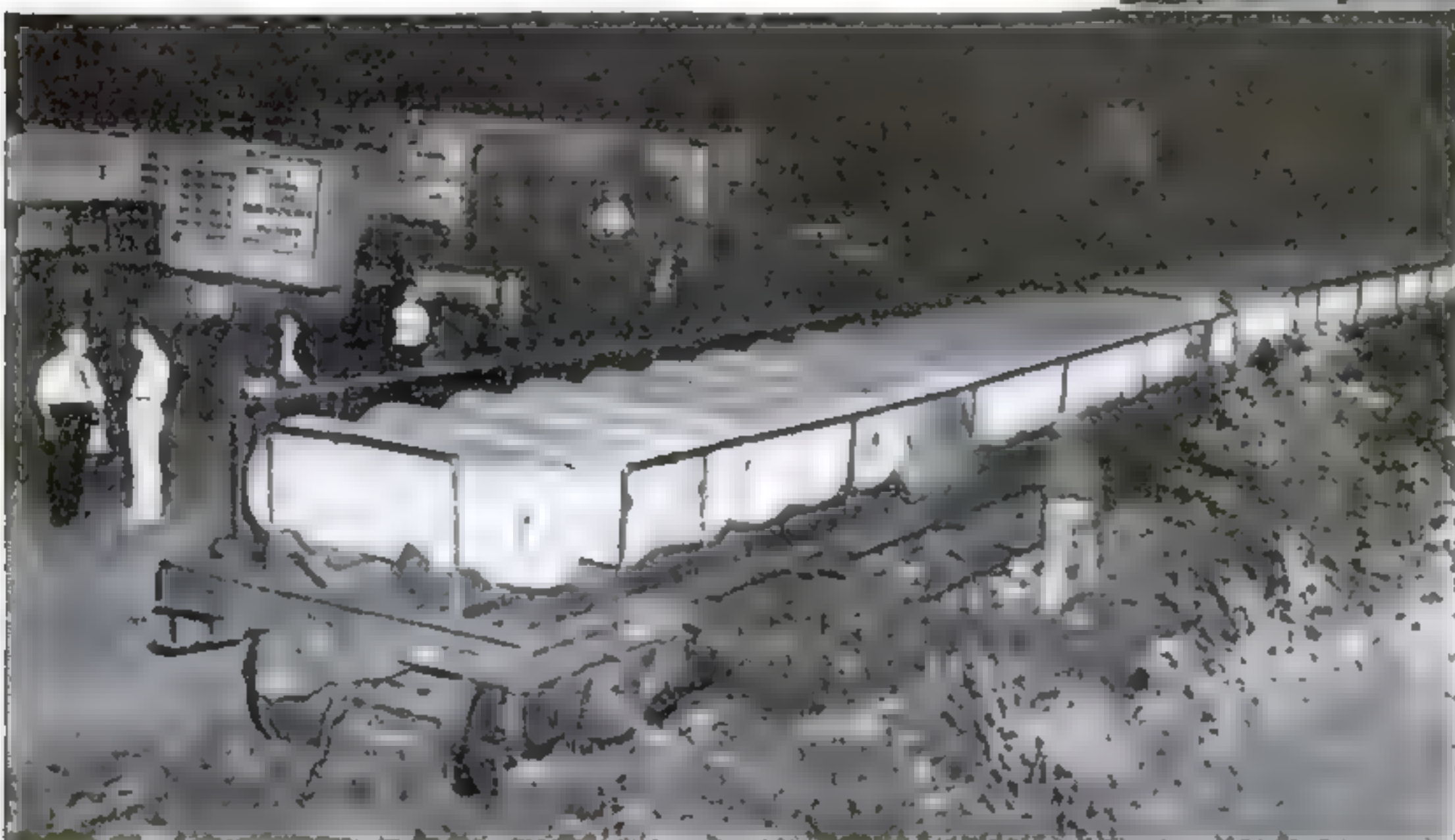
Safety Caravan Hauls Poison Gas



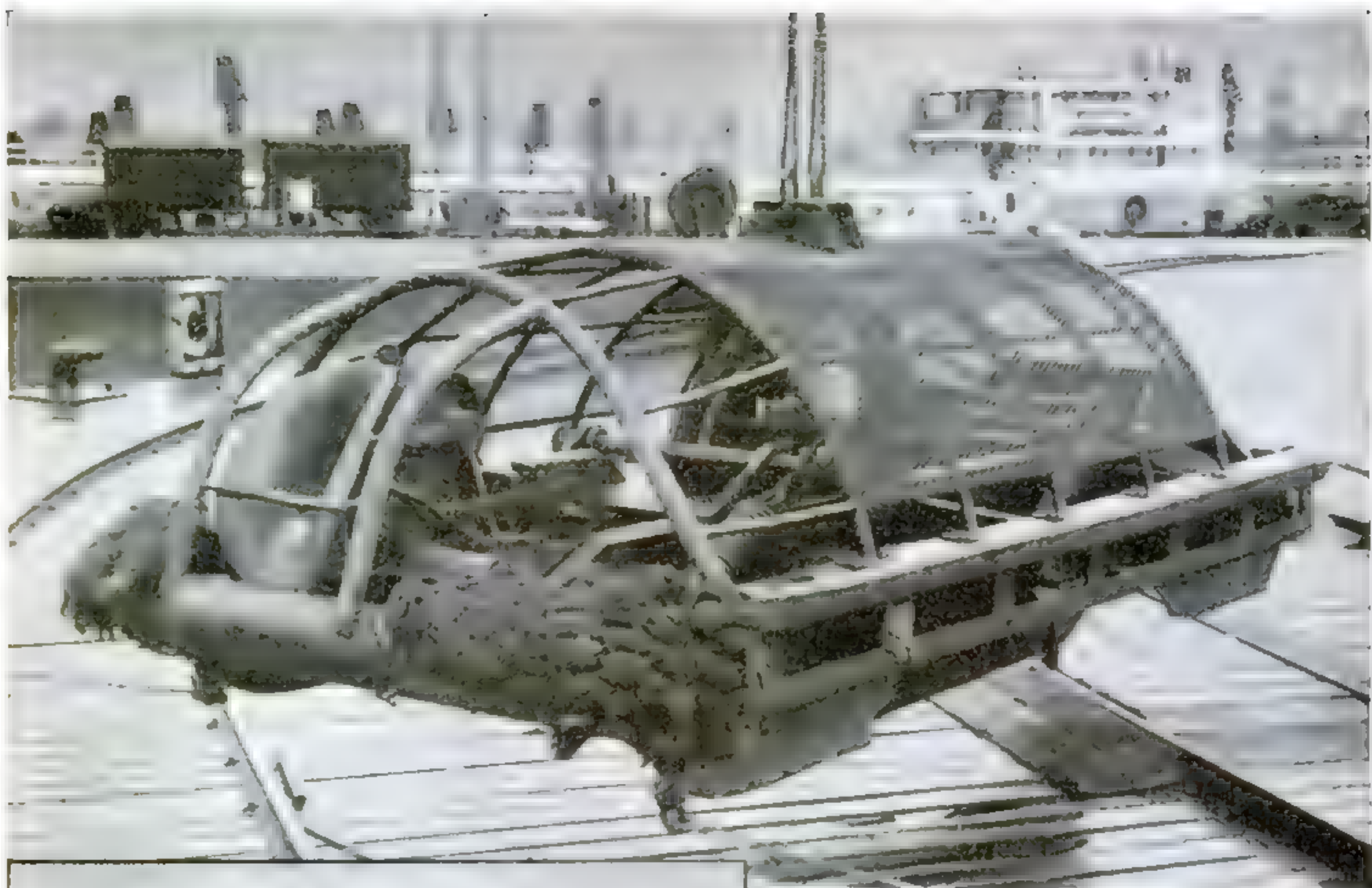
CREEPING at a snail's pace, a motor caravan of bottled death trundles twice a week through the streets of New York City in the early hours of the morning, as poisonous chlorine gas is transferred from railroad cars to plants where it is used to render liquid sewage germ-free. At the factory in Syracuse, N.Y., the chlorine is piped into cylindrical containers made of steel more than an inch thick. Routed by rail to a siding in New York, the cylinders are carefully transferred to waiting trucks by specially trained, gas-masked men working under the glare of arc lights and the vigilant eye of Fire Department representatives, since the gas could spread death over a large area if a container accidentally split open. Moving at about five miles an hour, the chlorine-loaded trucks crawl slowly through back streets to the sewage-disposal plants several miles away, where they are unloaded into specially constructed, air-conditioned storage warehouses to await use. The photographs on this page show some of the phases of this dangerous delivery job.



Gas masks are carried by drivers of trucks, at top of page, which convey cylinders of the deadly chlorine gas by night through New York City to sewage plants



Left, bottled death on flat cars as it comes from the factory, waiting to be loaded onto the trucks for delivery



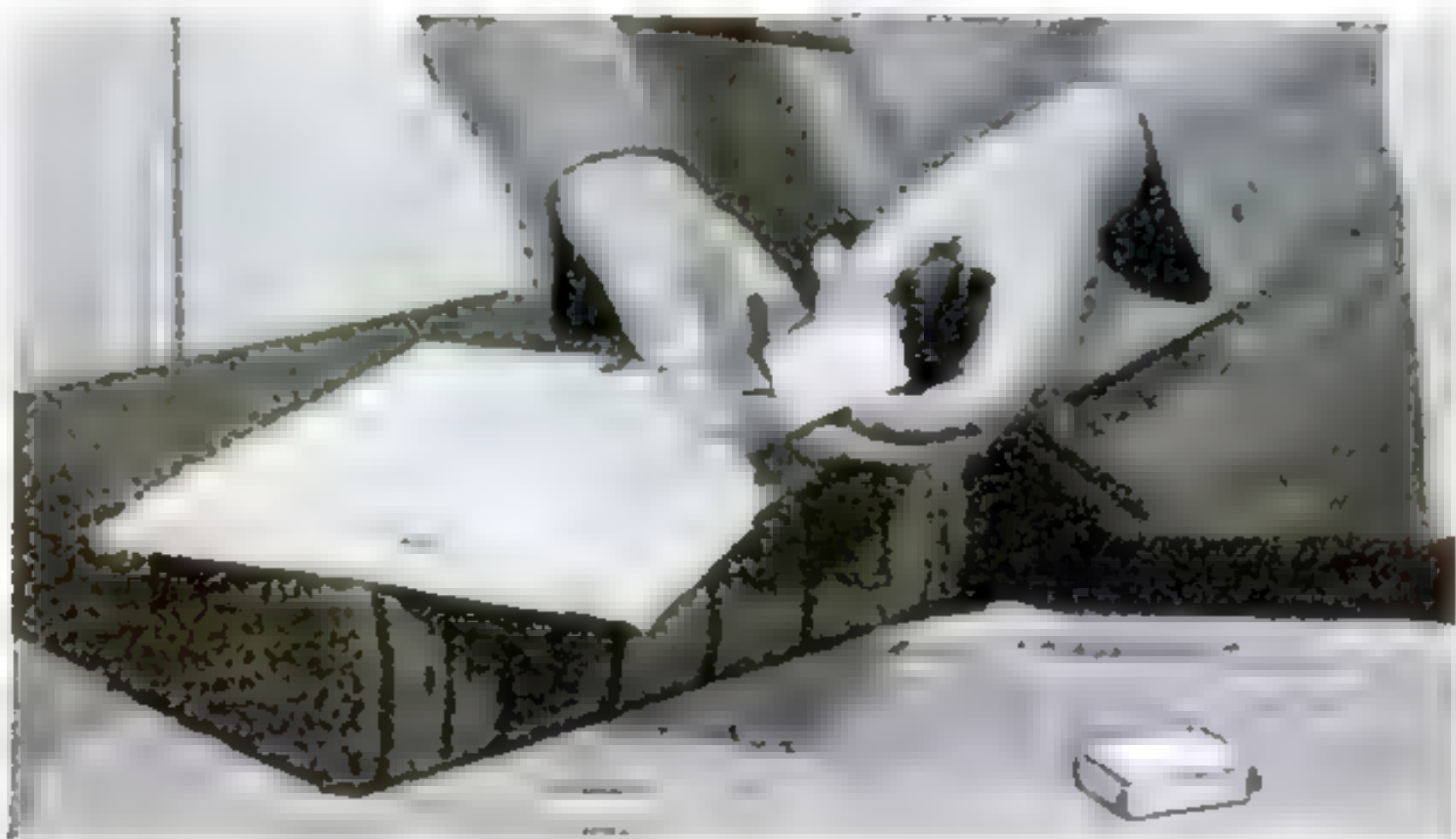
Drawing shows how the odd device seen in the photograph above digs a trench for cables in the ocean floor

Submarine Plow Buries Cables

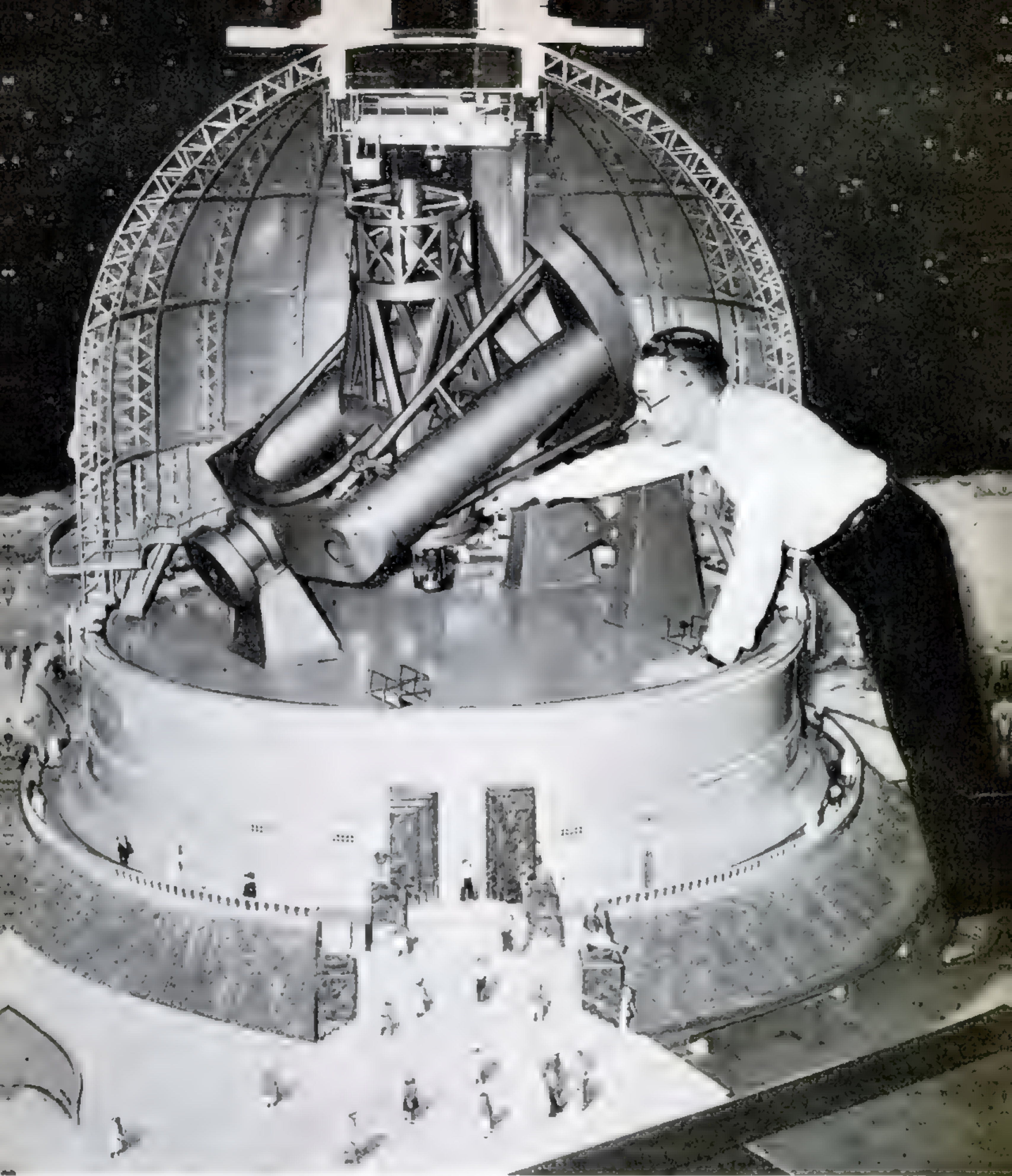
DRAGGED along the bottom of the sea at the end of a 4,200-foot, nickel-steel chain, a revolutionary submarine plow recently passed tests by burying transatlantic cables in the ocean floor 100 miles off the coast of Ireland. The plow, twenty feet long and weighing ten tons, was designed by Western Union engineers. Cables are fed to it from the towing ship and the device automatically buries them from eighteen inches to two feet deep in the sand and ooze of the ocean floor to protect them from damage by anchors of fishing boats.

Handy Office Aid Nonskids Fingers

BY RUBBING his fingertips over a block of newly marketed, antislip preparation, the office worker who sorts letters and papers, leafs through ledgers, or counts paper money, is able to prevent his fingers from slipping without resorting to the use of a wet sponge or rubber fingers. It is claimed that the substance does not leave stains or marks on the papers which are handled.



Fingers are rubbed on this preparation before sorting papers



Model Shows 200-Inch Telescope

MOUNT PALOMAR Observatory in California, and its 200-inch telescope, largest in the world, which will be placed in service in 1939, are depicted in miniature in a remarkable scale model constructed by

Samuel Orkin, above, in collaboration with the California Institute of Technology. One twenty-fourth the size of the \$15,000,000 observatory's fourteen-story-high dome, the model will be exhibited on a world tour.

Alloy Runners Give Ice Boats More Speed



Special runners step up the speed of these racers

This runner resists wear even on gritty ice

UP-TO-DATE ice-boat owners are getting more speed from their mile-a-minute craft by coating the steel runners with a modern, super-hard alloy. Originally developed for industrial machinery, this alloy of cobalt, chromium, and tungsten forms an armor of high resistance to wear. When a strip of it is welded on, with the aid of an oxyacetylene torch, the "hard-faced" ice-boat runner keeps its sharpness longer—and sharp runners are just as important in ice boating as in skating, for speed and ma-



Applying the alloy by means of an acetylene torch neuverability. If sand, coal, or dust has drifted over the ice, in sandy regions or near large cities, the alloy resists the abrasive action. In addition, the alloy has a lower coefficient of friction, or glides over the ice more easily, than steel. In a hotly contested race, the extra speed may spell the difference between losing and winning.

Rubber Puppets To Act in Animated Picture

PUPPETS made of rubber, whose flexible faces can be made to register any desired emotion, now serve as actors in animated movies. By shifting the figures slightly between each "frame," the effect of action is obtained. The two puppets shown at right, "Grease Boy" and "Miss Polish," will be seen in a forthcoming educational color film telling the story of the petroleum industry.



Photos FROM THE GRAVE

Peter Müllritter,
the photographer



Buried by an Avalanche, a Camera Preserves an Amazing Record on Film of a Himalayan Tragedy

WHEN thundering tons of ice and snow rushed in an avalanche down the side of Nanga Parbat, the Himalayan "mountain of death," last year, they buried a battered camera which held within its film chamber the most dramatic picture story of recent years.

Peter Müllritter, daring young cameraman with the group of German scientists who perished in the disaster, had filmed the fearful onrush of an avalanche before he was struck and killed. His body was never recovered. But searchers found his moving-picture camera and brought it back to civilization. Some of the most striking of the pictures it contained are shown on these pages.

Twice in three years, disaster ended attempts of German scientists to scale the 26,620-foot peak in northern India. In 1934, a sudden rush of rocks and ice killed four members of a party as they struggled upward on the slope. Last year, the toll was far greater. Sixteen men perished, including scientists and native porters. Only one member of the expedition, Dr. Ulrich Luft, remained alive. He had started down the mountainside

Avalanche in action. These remarkable pictures, made a short time before the expedition was entombed, were preserved in the camera buried beneath tons of cascading snow and ice





Like Flies on the Frosting of
Giant's Cake, Climbers Pick Their
Way Across Nanga Parbat's
Treacherous Slopes, at Right

This is the ice rock that
produced the avalanche pic-
tured. Turn photo upside
down, and note face in snow

First warning. Expedition
members brushing themselves
off after the first slide of
snow had swept across them



Rendezvous with death. This is the ill-fated
party photographed at the start of the climb,
with Nanga Parbat looming ominously above
them. Only one man in the group came back





A native porter. Nine of these men lost their lives when disaster came



A typical mountain camp. In such wind-swept shelters, who brave arctic cold and lung-searing rarefied air



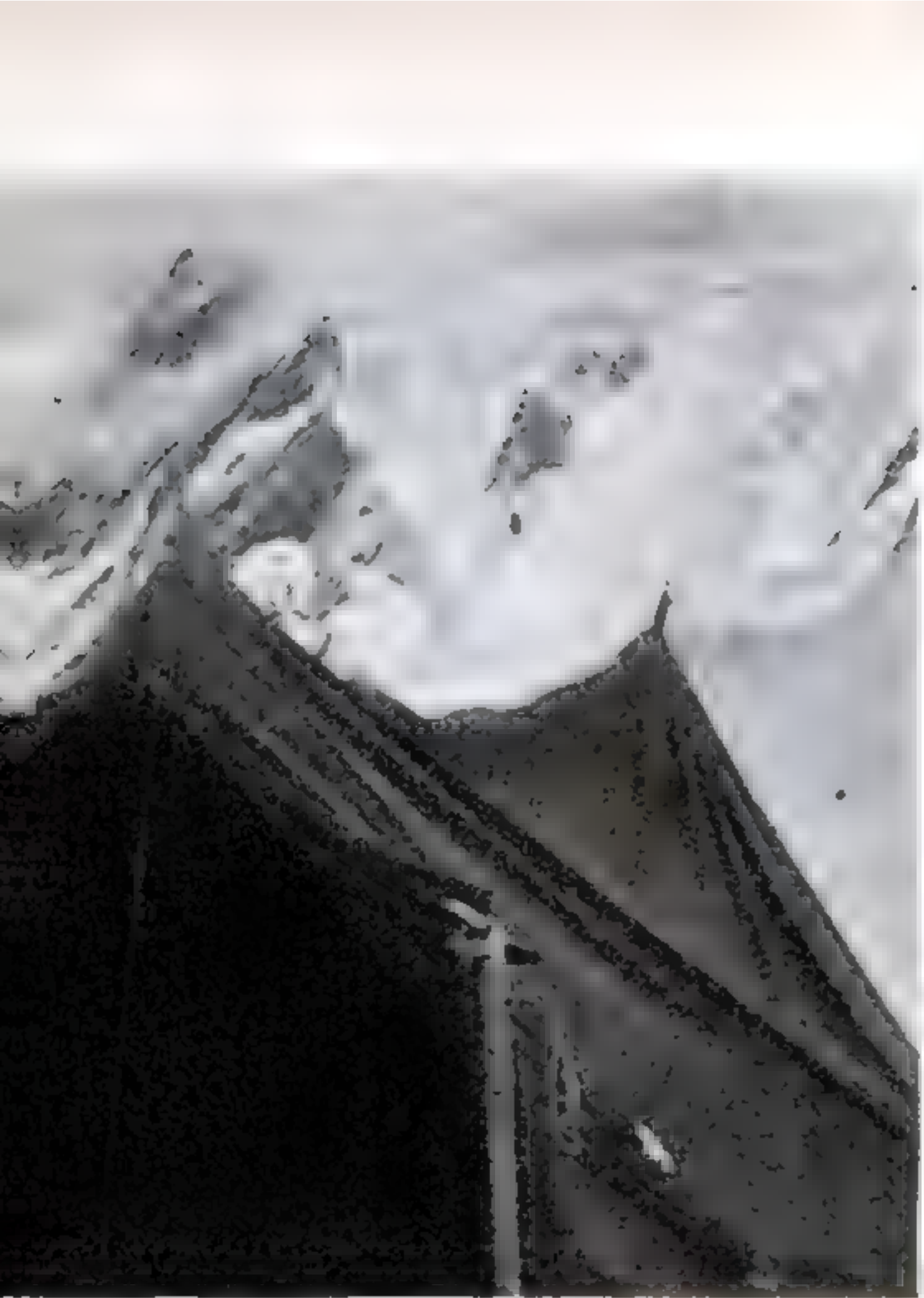
Searching the deep drifts for traces of the lost expedition. Under a slide like this they found the bodies—and the camera with its tragic film record

with a sick porter before disaster struck.

It was Dr. Luft who led another party up the treacherous slope in search of the bodies of the lost scientists. In digging at the site of the last camp, they uncovered Müllritter's camera with its amazing portrait of an avalanche in action. That film brought to a tragic climax the picture story of the expedition's ill-fated assault upon Nanga Parbat.

After weeks of struggle, the party was nearing its goal. The camp was made beneath a great overhanging cliff of ice in a lofty gap called "the silver saddle." While the climbers were preparing for the final thrust upward to the peak, they heard a roar above them that grew louder every moment. A great white cloud of snow was sweeping down the mountain side toward them.

Müllritter swung his camera into action, recording just how an avalanche appears to those in its path. The snow rushed over the camp, burying equipment and men. But the men dug themselves out, and Müllritter filmed them brushing away the snow. Then, without warning, the whole front of the frozen cliff above them broke loose and the ice, roaring down the mountain side, brought death to the daring band. But, within the sturdy camera, a strip of celluloid had preserved a thrilling sequence of pictures which enabled the world to visualize the expedition's tragic end.



Pitched high among the Himalayan snows, live the men trying to conquer Nanga Parbat, Mountain of Death



Led by the one survivor, climbers went out to recover the bodies. Here one is making his way over a drift

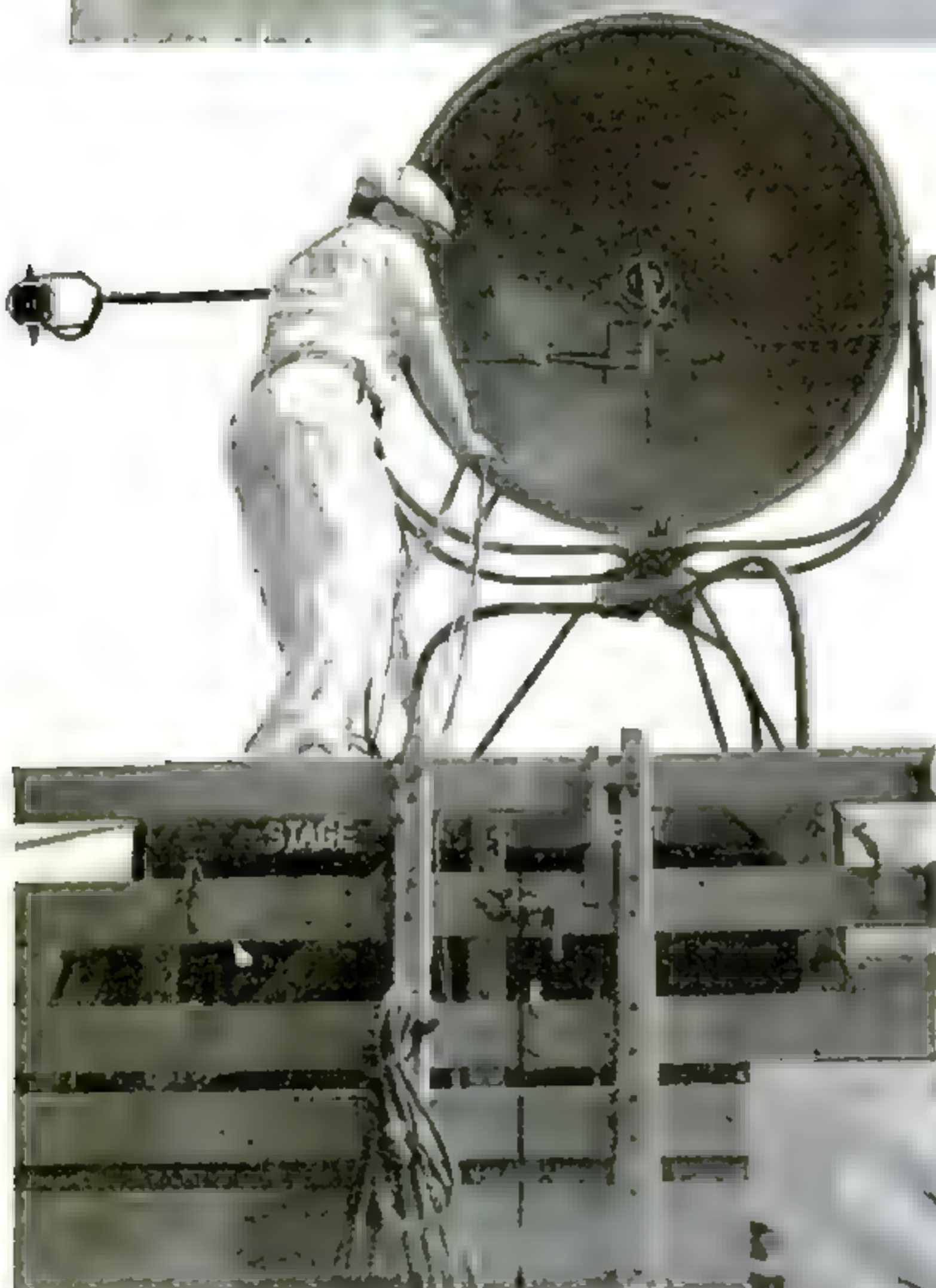


Men against mountains. Eight members of a climbing party making their way over an icy slope. Over them always hangs the avalanche peril



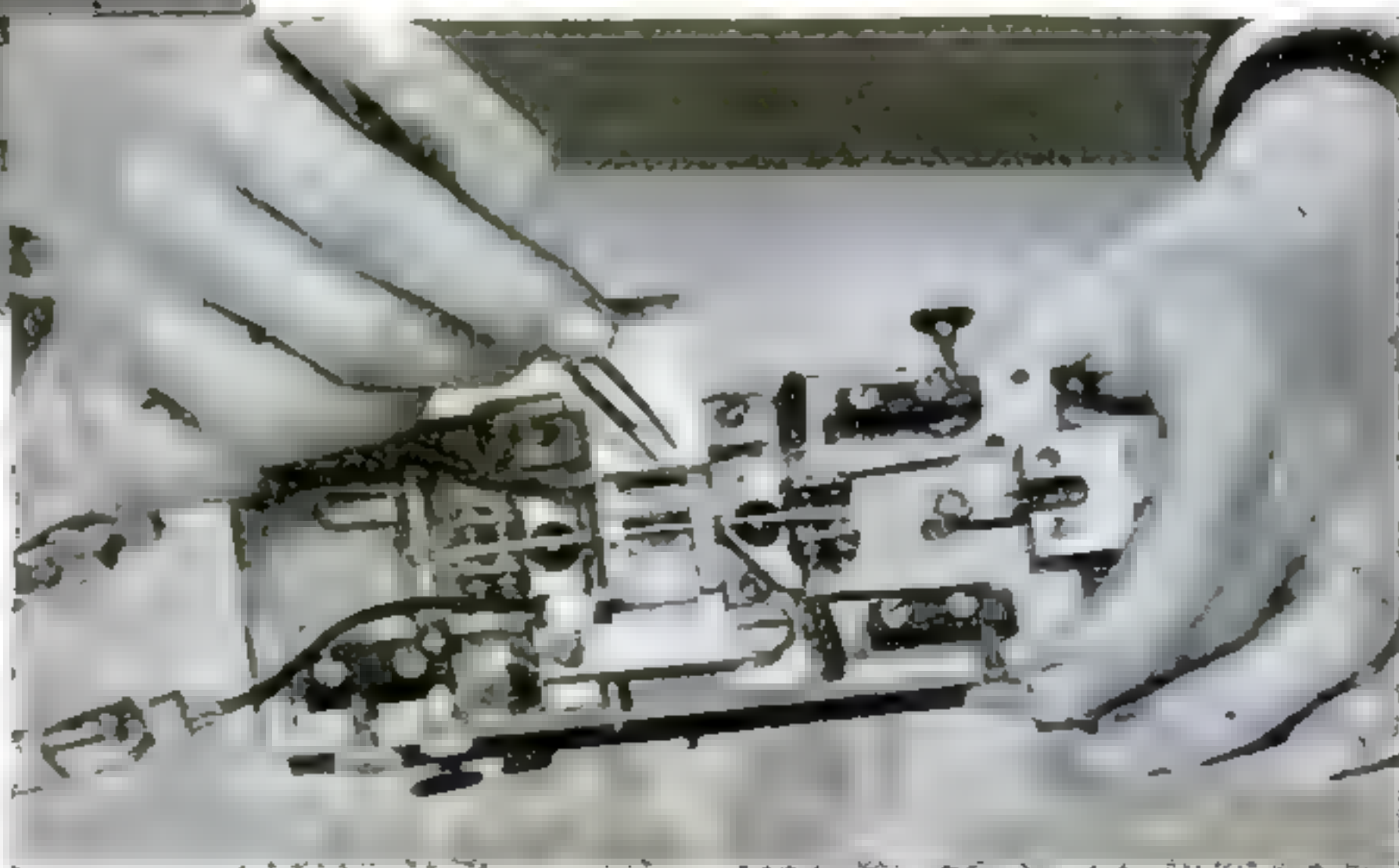
Twin Mikes Mix Sound for Aviation Movies

THROUGH an ingenious hook-up of microphones, the spine-tingling crescendo of an airplane's roar as it swoops toward the sound camera is now recorded realistically for the movies. A huge bowl-shaped reflector, with a sensitive microphone unit at its center, catches the direct sound of the motor's bark and the propeller's whine. Meanwhile a smaller mike at one side picks up the reverberations from the ground, and the voices of near-by actors in the drama. Registering simultaneously on the sound film, the two microphones are under separate control so that any desired "mixing" effect may be obtained. An ingenious "light valve" regulates the light reaching the sound track in accordance with the volume of sound.



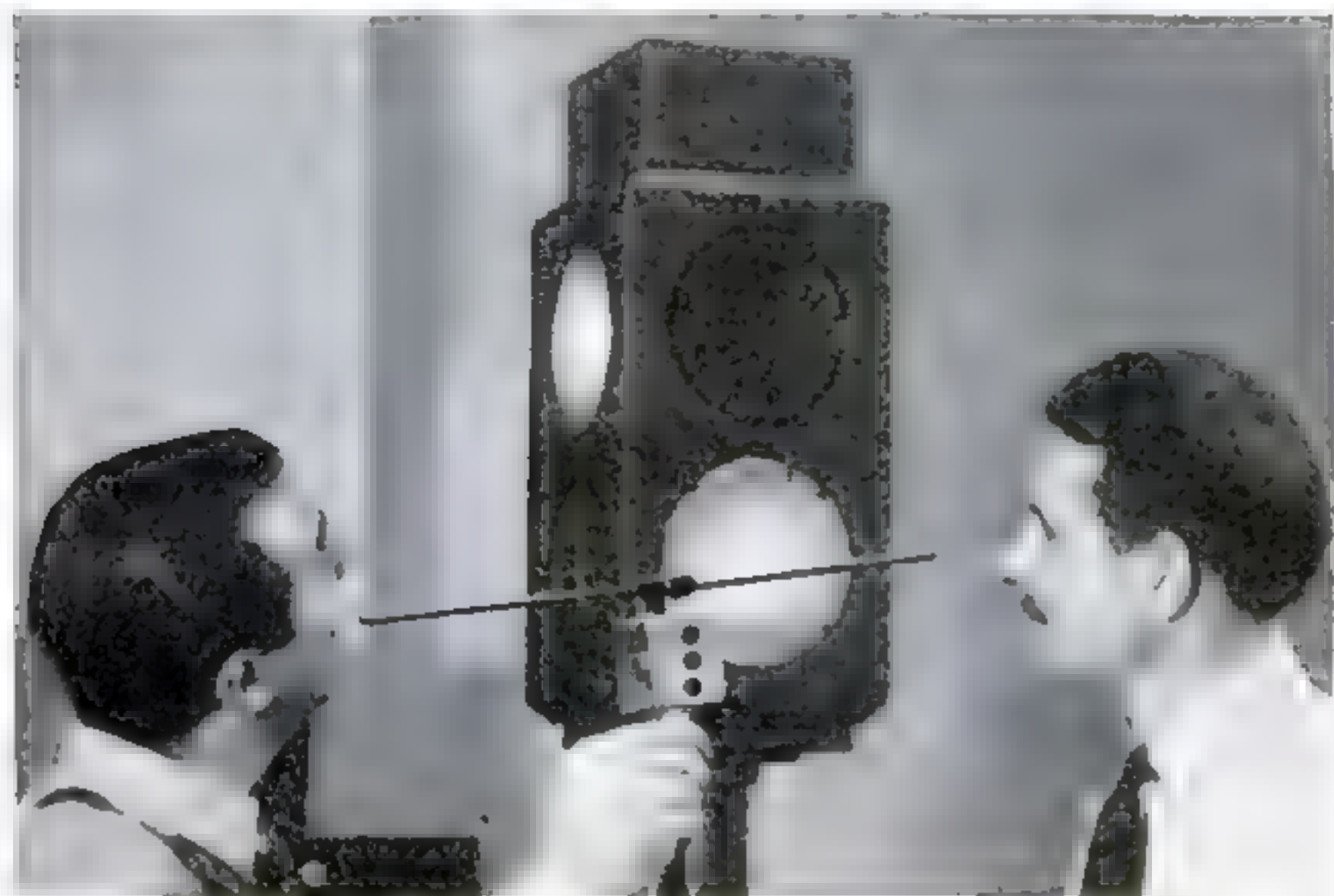
As a plane swoops past, a microphone in a bowl-shaped reflector catches the noise of its motor and propeller, while a smaller microphone registers sound on the ground

At the right is the "light valve" in which thin wires move closer together or farther apart as sound volume varies



Cars Get Radio Traffic Lights

BROADCASTING highway traffic signals to radio-equipped passenger cars, as predicted by experts not long ago (P.S.M., May '38, p. 27), is brought nearer to realization by the recent perfection of a radio traffic-control beacon. Under this system, automatic short-wave transmitters mounted on traffic-light standards operate stop, go, and caution lights on car dashboards.



Testing a radio that lights "traffic" signals on a car's dash

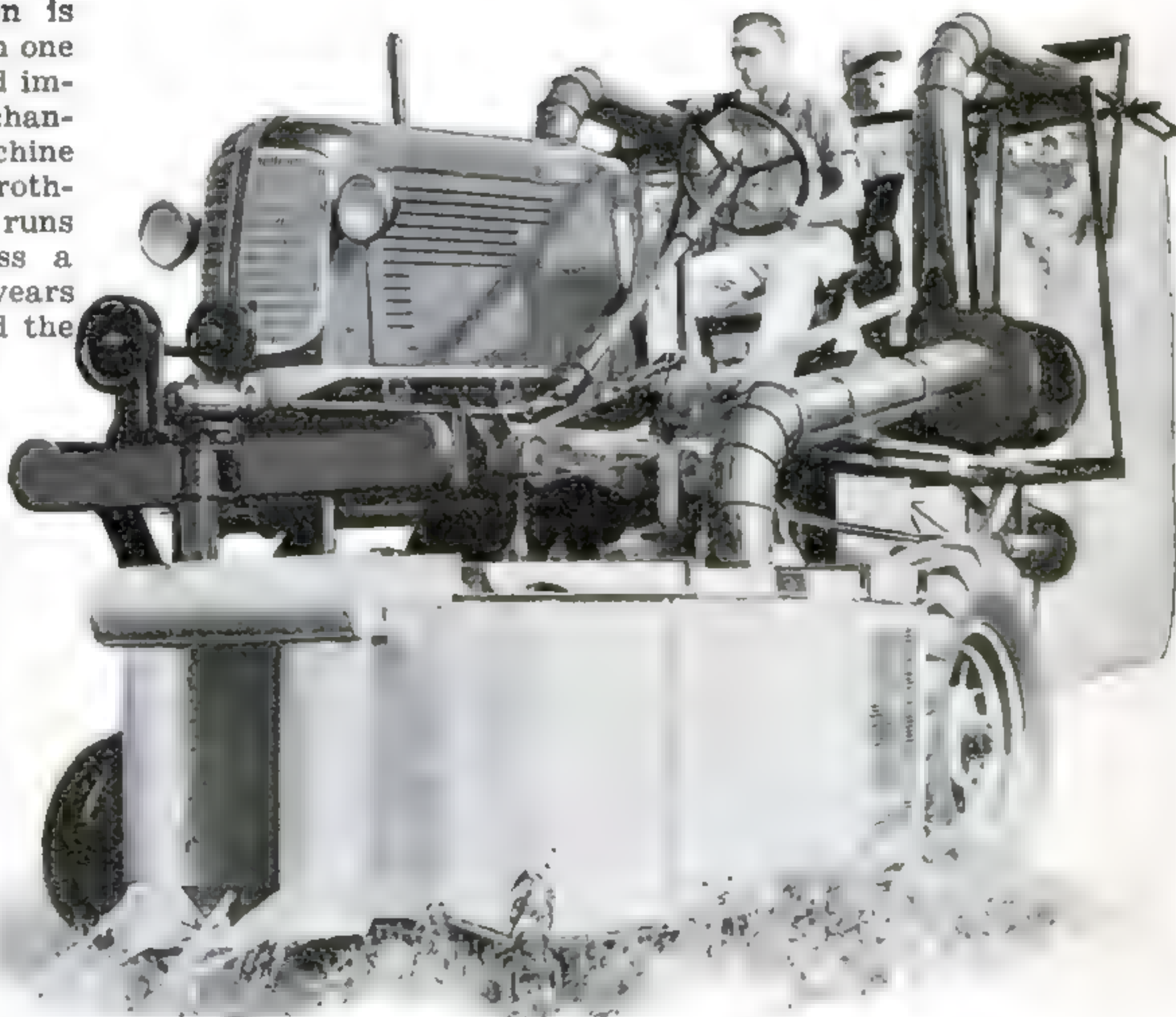


Extension Cord Is Mounted on Reel

WINDING a long stretch of electric extension cord on a special reel makes it easy to use electrical accessories at points where a current supply is not readily available. Brass spring brushes contacting rings on the reel, to which the extension-cord wires are soldered, provide a connection between the reel and the regular household wiring circuit.

New Mechanical Cotton Picker Does Double Duty

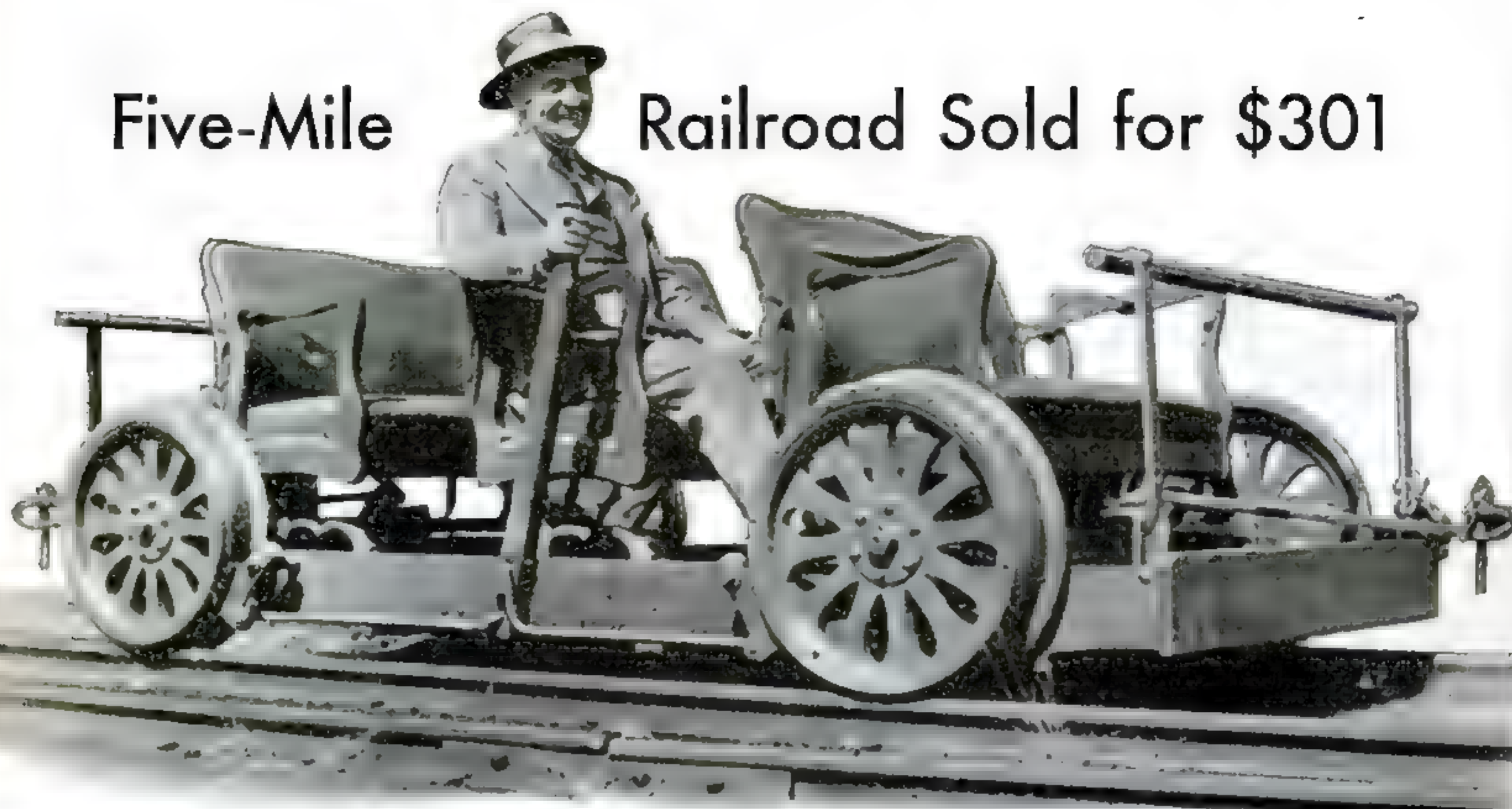
EACH row of cotton is picked over twice in one operation as a new and improved model of a mechanized cotton-picking machine perfected by the Rust brothers, of Memphis, Tenn., runs back and forth across a cotton field. Following years of experimentation and the adoption of a host of refinements, the tractor-driven mechanical picker is now said to be improved to the point where commercial production of the machines can be started. Because the apparatus seems destined to replace thousands of hand pickers, the inventors have delayed pushing the development of their machine until some means can be evolved for the protection of the cotton pickers who would be thrown out of work.



Each cotton row is picked over twice in one operation with this new picker

Five-Mile

Railroad Sold for \$301



ONE gasoline-powered engine, one caboose, and the odd open-top passenger car shown above comprise the entire rolling stock of the Wood River Branch Railroad, a unique branch line which Roy Rawlins of

Hope Valley, R.I., recently purchased from a major eastern railroad for \$301. An average of four "trains" a week make the round trip over the five-mile roadbed between Hope Valley and Wood River Junction, R. I.



How the pocket ash tray clips to cigarette package

Pocket Ash Tray Clips to Cigarette Package

FASTENING to the side of a package of cigarettes by means of a clip, a new accessory shown in use in the illustration at the left provides a convenient pocket ash tray for the smoker. A sliding cover permits the smoker to carry the container in a pocket or hand-bag without fear of spilling ashes, match sticks, or butts. Since the sliding cover fits snugly to make the container air tight, burning cigarette butts are automatically snuffed out, preventing smoldering.

Blinders for Learners Teach Driving Dangers

TO DEMONSTRATE how defective vision and dirty side windows on an automobile can affect the driving efficiency of motorists, students of a traffic school drive a special car equipped with dual controls while they wear glasses that distort their eyesight and blinders that narrow their field of vision, making them unable to see to the right or left without turning their heads. An instructor accompanying each student takes over the duplicate set of controls whenever driving conditions become dangerous enough to justify it.



These blinders teach the importance of clean car windows



Solicitor in diving regalia helps raise funds for sea-rescue work

Water Softener Protects Cars

EMPLOYING zeolite, a mineral of the silicate group, a new device for motorists softens hard water and removes the impurities which cause the formation of scale in the radiator and cooling system of a car. The metal unit is attached to the end of a hose, so that water flows through it into the radiator. The efficacy of the water-softening material can be restored by treatment with table salt.



Water is softened as it flows through the unit into the radiator of the car

Diver Collects Cash in Drive

DRESSING a solicitor in the full regalia of a deep sea-diver was the novel means employed recently by the British Lifeboat Institution to attract the attention of pedestrians on the streets of London to their campaign for funds. Fully equipped, from lead-weighted shoes to a heavy steel diving helmet, the solicitor clumped along the sidewalk selling buttons to passers-by. The photograph at the left shows a woman making a contribution to the fund.

Witness Stand Is Wired for Sound



TO MAKE sure that juries are able to hear clearly each word spoken by witnesses on the stand, a Los Angeles, Calif., court is now employing a public-address system with the witness answering questions through a hand microphone. On many occasions, it is believed, members of the jury miss part of the testimony by reason of the low voices of the witnesses or because of bad acoustics. The photograph above shows a witness telling her story to the microphone.

This Automobile Is a

ROLLING swiftly down highways on ten oversize balloon tires, a revolutionary airport-in-miniature for use by passenger air lines and military air forces now provides quick and complete assistance to stranded airplanes. This curious "twelve-ton tool box" is the invention of Kibbey W. Couse, of East Orange, N. J. It is capable of turning any level cow pasture into an airport complete with machine shop, repair parts, floodlights, and radio.

The machine can race to the scene of a forced landing at forty-five miles an hour. It can climb hills with a thirty-five-degree grade. It can roll over rough ground and across ditches. It can tilt thirty-five degrees from a vertical position without tipping over. It can even slide, sledlike, across stretches of soft mud, resting on the smooth, welded-steel bottom and propelled by endless treads attached to the rear wheels. A scientifically designed plow forms a sort of keel at the nose of the machine and reduces resistance as it moves ahead.

Reaching the scene of the forced landing,

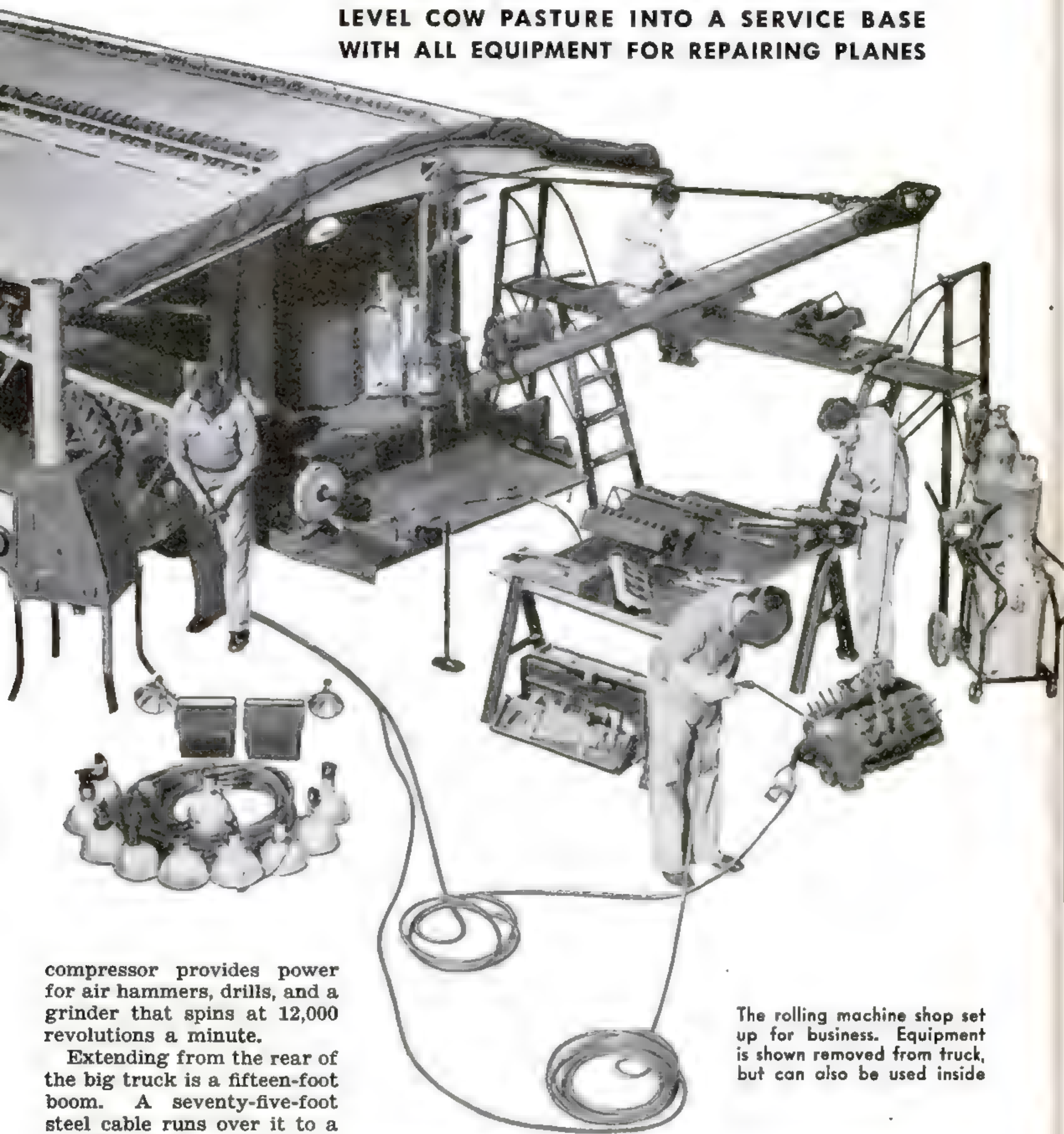
the crew riding in the rolling airport are ready for any emergency. On board they have 3,000 different tools and machines. There are kits for repairing metal wings and fabric wings; kits for overhauling motors; kits for radio testing and repair. There are aids to sheet-metalworking, carpentry, blacksmithing, electric-arc welding. There is a complete machine shop including a lathe, drill presses, and a milling machine. An electric still provides distilled water, cooled by a special radiator, for use in storage batteries, while a bench is equipped for recharging six batteries at a time. A compact air

Night scene with the mobile airport. Portable floodlights mark the landing field, while powerful searchlights rake the sky to guide pilots and signal the direction of the wind



Complete Airport

**TWELVE-TON TOOL BOX ON WHEELS TURNS ANY
LEVEL COW PASTURE INTO A SERVICE BASE
WITH ALL EQUIPMENT FOR REPAIRING PLANES**



compressor provides power for air hammers, drills, and a grinder that spins at 12,000 revolutions a minute.

Extending from the rear of the big truck is a fifteen-foot boom. A seventy-five-foot steel cable runs over it to a two-ton winch. This equipment permits the mechanics to hoist big engines from planes for complete overhauls. In fact, when the mobile airport goes on a run, it is equipped for doing anything from shoeing a horse to rebuilding an airplane.

The rolling machine shop set up for business. Equipment is shown removed from truck, but can also be used inside

When a temporary airport is set up, the cab of the truck becomes the operations office. It contains a card file and a typewriter stand so that careful records can be kept of the work done. It also contains the powerful two-

Two-way radiotelephone and telegraph apparatus is installed in the sound-proof cab. A master switch near-by allows the operator to shut off all machinery to eliminate interference



This compartment of the cruising airport contains a lathe, a band saw, and a drill press. Note the efficient arrangement

way radio equipment which can function either as a radiotelephone or as wireless telegraph. Beside the radio stand is a master switch. By flipping this, the operator can cut off any electric machines being used in the rear compartments of the truck if they are causing interference. The radio equipment can be used when the truck is rushing along a highway as well as when it has come to a stop. Seats within the roomy cab fold down into beds for two men.

The steel sides of the big machine are hinged so they can be raised to form awnings shielding the workers from sun and rain. In winter, a coal stove heats the interior. In addition, the blacksmith forge is so made that the sides can be removed to turn it into a supplementary heating unit. The spare wheels, complete with tires, are carried in front on a steel-tubing framework where they act as bumpers and enable the mobile airport



For running in soft or miry ground, endless treads are attached to the rear wheels. A plow at the nose keeps the front axle clear

to push like an elephant in helping to remove trucks or field guns from the mire.

Part of the equipment of the truck which will be of special value in military service is the electric generator and a complete set of



Crew members snatching a little sleep. Seats in the roomy cabin fold down to provide beds for two men. For war use, the arsenal at right holds four rifles



Below is a front view of the mobile airport on the road. Spare tires are mounted at the nose to serve as bumpers, and for pushing trucks or field guns. A scientifically designed plow guards the axle from damage by rocks or logs





When operating as a base for military aircraft, the truck can easily be camouflaged with boughs, or even driven under trees for concealment, as shown above

searchlights, floodlights, and boundary lights. The beams of the searchlights, thrown upward, can be seen by airmen from a distance of fifty miles, while the floodlights will illuminate the makeshift field and help the pilot land. By tilting the beam of the small searchlight mounted on the cab of the vehicle, the men on the ground can indicate the direction of the wind when a plane is coming in for a night landing.

In crossing rivers or in working on seaplanes, the mobile airport can be run onto a pair of standard army pontoons. Anchored near an air-and-water craft, it would have all the equipment required for either minor or extensive repairs. On the highways, these rolling machine shops can repair motor cars or army trucks which have broken down and are obstructing the advance. Also, the inventor points out, each truck has the facilities that might be required not only to repair itself but to build additional mobile airports of the same design.



This is the unit's water supply. The man is pumping water through a filter that makes it fit for drinking, whatever its source. At the left is the compact electric still, fitted with a miniature radiator as a condenser, that distills water for storage batteries

Tells Tomorrow's Temperature Today



Prof. C. M. Heck testing his heat forecaster atop a New York skyscraper

DESIGNED to supplement existing weather-bureau apparatus by forecasting changes in temperature, a novel long-distance thermometer invented by Prof. Charles M. Heck of North Carolina State University was tested recently in New York City. Heat given off by the earth's surface, Professor Heck states, is absorbed by moisture in the air and then re-radiated. The new instrument, which consists of a thermometer mounted within aluminum reflectors, is aimed at the sky to register the temperature of the re-radiation centers from which heat is reflected back to earth. By this means it may be possible to predict accurately, soon after sunset, the maximum and minimum temperatures for the following day.

Vacuum Cleaner Purifies Air

SMALL enough to rest on a bedside table, a vacuum cleaner now on the market has a special attachment that makes it useful for purifying the air in a sick room. Employing turbine-type blades instead of the conventional revolving fan to create suction, the unit draws room air in through a nozzle and passes it through a "germ trap" said to remove any dust and other impurities it may contain.



Air sucked through the cleaner passes through a "germ trap"



New Arc-Welding Kit Aids Amateur Craftsmen

ALUMINUM, brass, copper, steel, and other metals can be easily and economically welded with a new low-cost arc-welding unit just marketed for home owners and amateur craftsmen. Operating from any 110-volt electric outlet, the welder can also be used for brazing and soldering.

Famous

DARING STUNT MEN PILOT
THRILLING COLOR MOVIE



Paul Mantz, technical adviser, at the controls of a Curtiss pusher biplane that was resurrected for a part in the aviation color movie, "Men with Wings"



A man-carrying kite of the type used in early aviation experiments. In the picture, it was lifted into the air by wires



WINGED CAMERA. For filming thrilling air sequences, color cameras were mounted in various positions on camera ships. This one turns on a ball-and-socket mount, and the operator is lashed down with a belt



Planes Fly Again

TWENTY-YEAR-OLD SHIPS IN SHOWING AVIATION'S HISTORY

WORLD WAR fighting planes of four nations roared over southern California recently while cameras ground out scenes for "Men with Wings," first air picture to be filmed in color. Rebuilt Nieuports, Spads, Fokkers, and De Havilands rode each other's tails in thrilling sequences, which also brought into the air a man-carrying kite, a power glider, and other flying machines representing the development of aviation from earliest days to the present.

Planes of wartime vintage, including a Curtiss pusher biplane, a Phalz D-X 11, a Thomas Morse Scout, and an S.E.5, figuratively rubbed wings with modern ships. All were rebuilt and their motors reconditioned. For close-up scenes requiring larger numbers of planes on the ground, dummy ships, including seven mock Fokkers, were constructed in the studio carpenter shop.

Earliest aviation history comes to life in the form of a man-carrying kite and a gull-like monoplane built on the lines of one con-

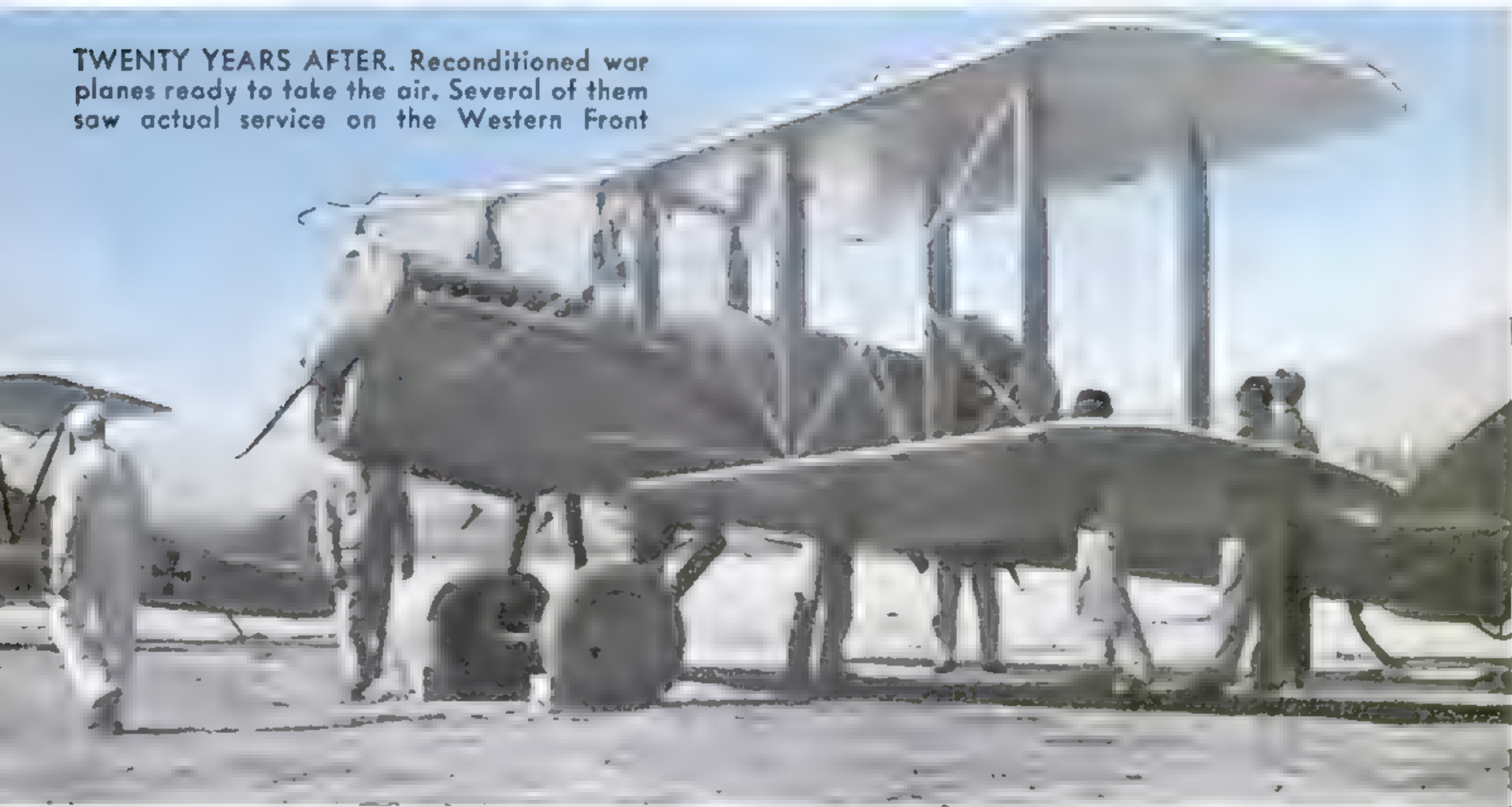


By
**ANDREW R.
BOONE**

Air battles of the World War were reenacted realistically. This ship took the part of a German Fokker

constructed by Gustave Whitehead at Bridgeport, Conn., in 1900, three years before the Wright Brothers successfully launched their biplane at Kitty Hawk, N. C. In the picture, these experimental models were carried into

TWENTY YEARS AFTER. Reconditioned war planes ready to take the air. Several of them saw actual service on the Western Front





This veteran Fokker came to grief in making a landing on a California field. At the right, a mechanic is spinning the prop on a dummy Fokker for ground sequences

the air by wires. Otto and Wally Timm, California airplane manufacturers, constructed the monoplane from photographs of the original, powering it with two four-cylinder engines, one of which turned the two propellers, the other driving the wheels along the ground to get up speed.

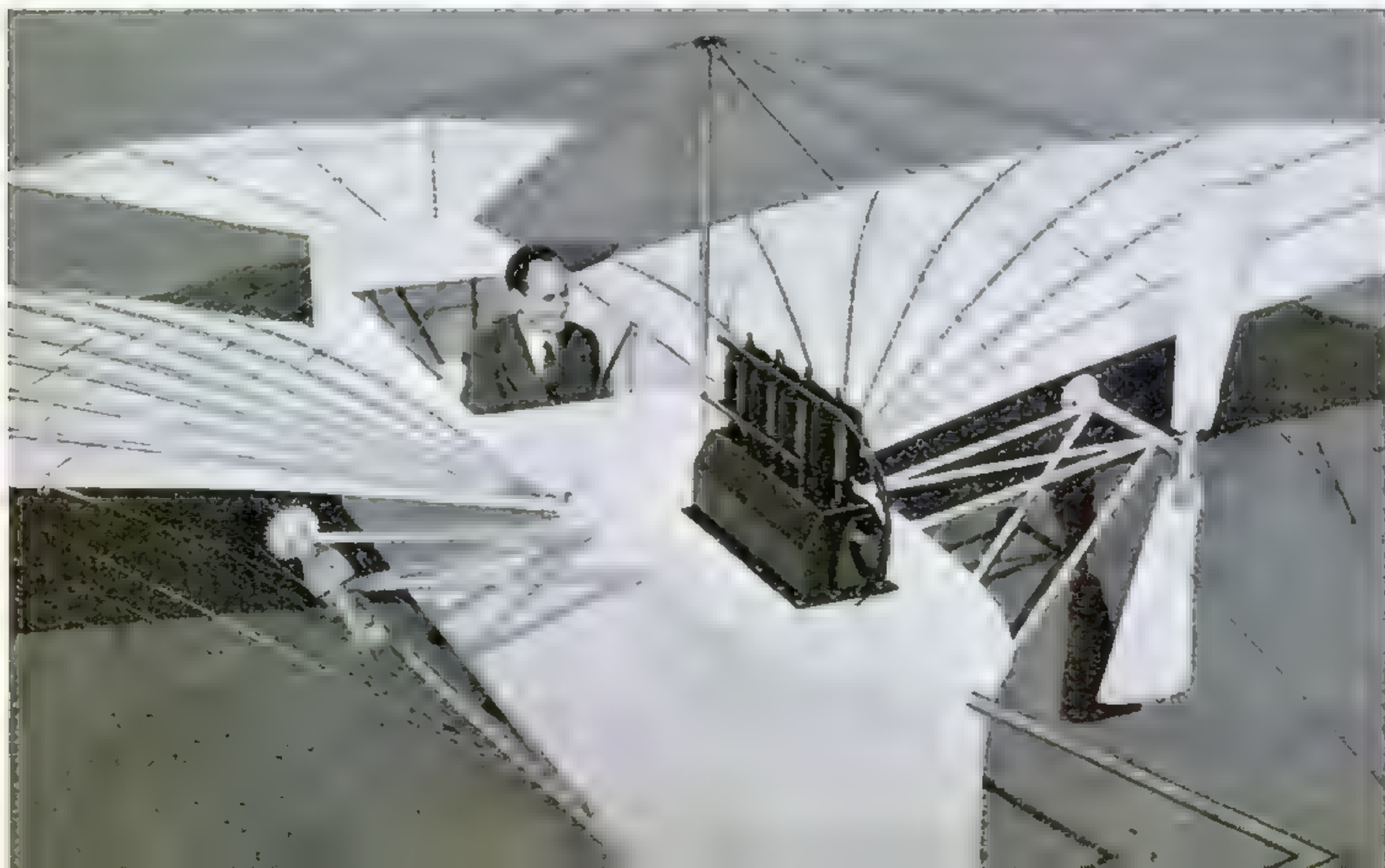
Bulky color cameras were mounted on tops of wings, between front wheels, and in cockpits of camera ships. Cameramen, exposed to the air, were lashed in with



wide belts. Cameras, mounted on ball-and-socket joints, could be turned in any direction.

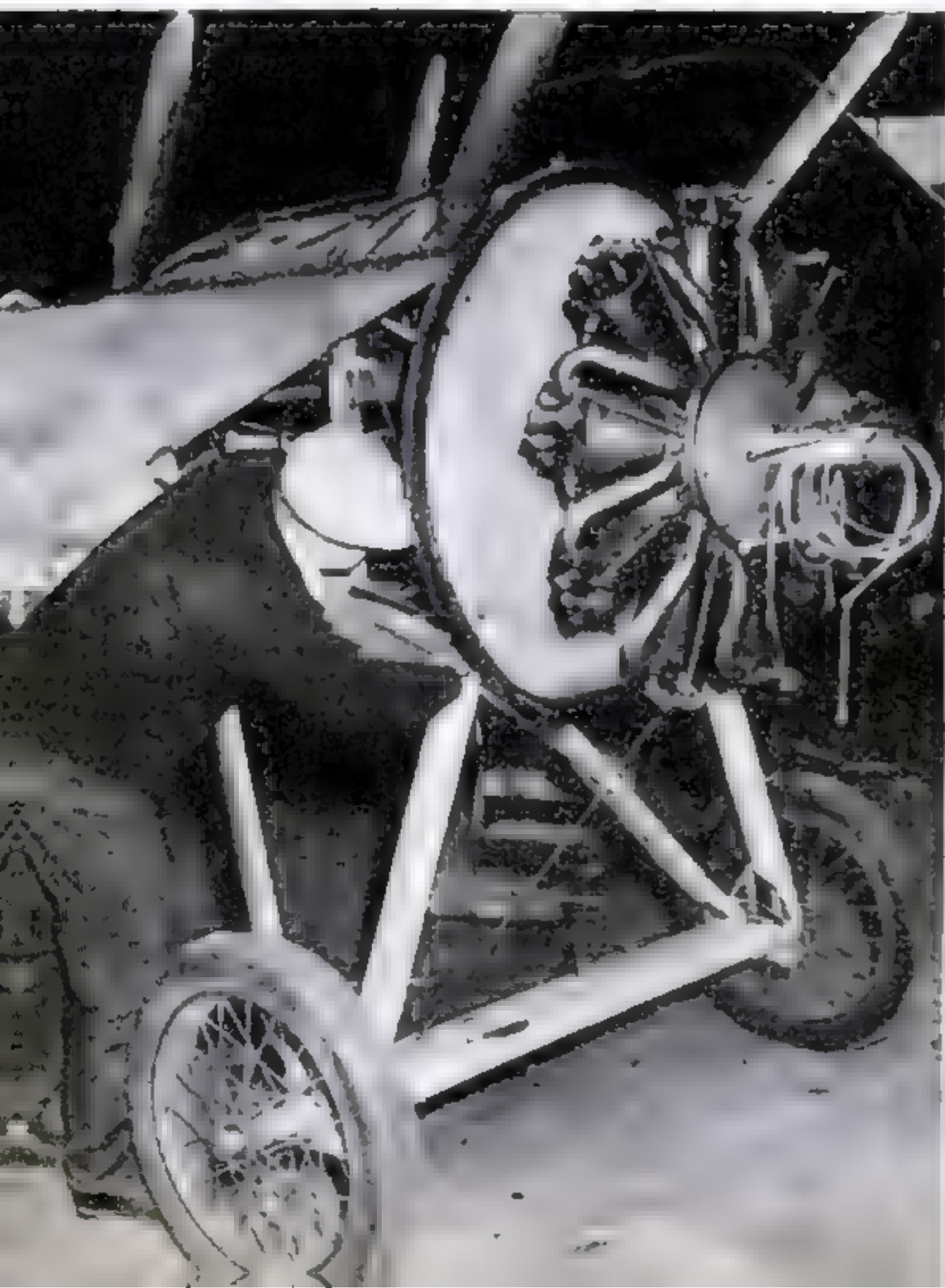
Paul Mantz, famous technical adviser to other aviators, test-flew each plane before it was filmed. Veteran stunt pilots flying the twenty-year-old ships with Mantz in daring sequences reenacted aerial combats above the battlefields of France.

ANCIENT HISTORY. The queer craft below is an accurate reproduction of one of the ancestors of the modern airplane—a monoplane built by Gustave Whitehead at Bridgeport, Conn., in 1900. Refusing to fly, the reproduction was hoisted on wires for its part in the filming of the picture





Franke Clarke, stunt flyer, behind the machine gun of a Spad. The wartime plane at left, found in the basement of a California hotel, had on its instrument panel the initials "W.A.W.," carved there by William A. Wellman, the director of the movie, when he was an Army pilot in the World War



Director Wellman, at right, above, planned all the maneuvers in the movie with the aid of toy airplanes, to make sure that every movement would be effective. In the photograph at the left, a twenty-year-old Gnome-Monosoupape motor is being installed in a Nieuport fuselage for flight



When detectives cannot enter a suspect's room to plant a microphone or tap his telephone wire, they often use a contact microphone like the one shown above. Attached to a wall, it picks up the slightest sound in the next room

SECRETS OF THE Wire Tappers

By ROBERT E. MARTIN

HOW do crime sleuths "tune in" on the meetings of gangster mobs? How do police detectives provide prosecuting attorneys with phonograph records of telephone conversations that contain damaging evidence against criminals? Most of this work is done by expert wire tappers, specialists in the art of scientific eavesdropping, and how they do it and the ingenious equipment they use is graphically illustrated in the photographs on these pages.

Until recently, police could listen in on the telephone of a suspect only by making a "raw tap," that is, by ferreting out the suspect's telephone line from a maze of others, scraping away the insulation, and attaching a receiving instrument. Now, using the latest scientific aid to wire tapping, they simply place a tiny induction-coil cylinder anywhere within thirty-five inches of the suspect's telephone box, even though a thick building wall intervenes. If they have concealed themselves in an adjoining room, for ex-



Concealed microphones play an important part in scientific eavesdropping. Carefully hidden wires connect them with listeners' earphones, or with recording machines like that at right



ample, they hold this phantom wire tapper against the opposite side of the wall to which the suspect's box is attached. Or, if the phone is near an outside wall, they carefully lower the coil along the exterior of the building from the roof or from an upper room. Electrical impulses radiating from the telephone box are picked up by the coil, wired to a powerful amplifying unit, and reproduced either through a loudspeaker or through headphones.

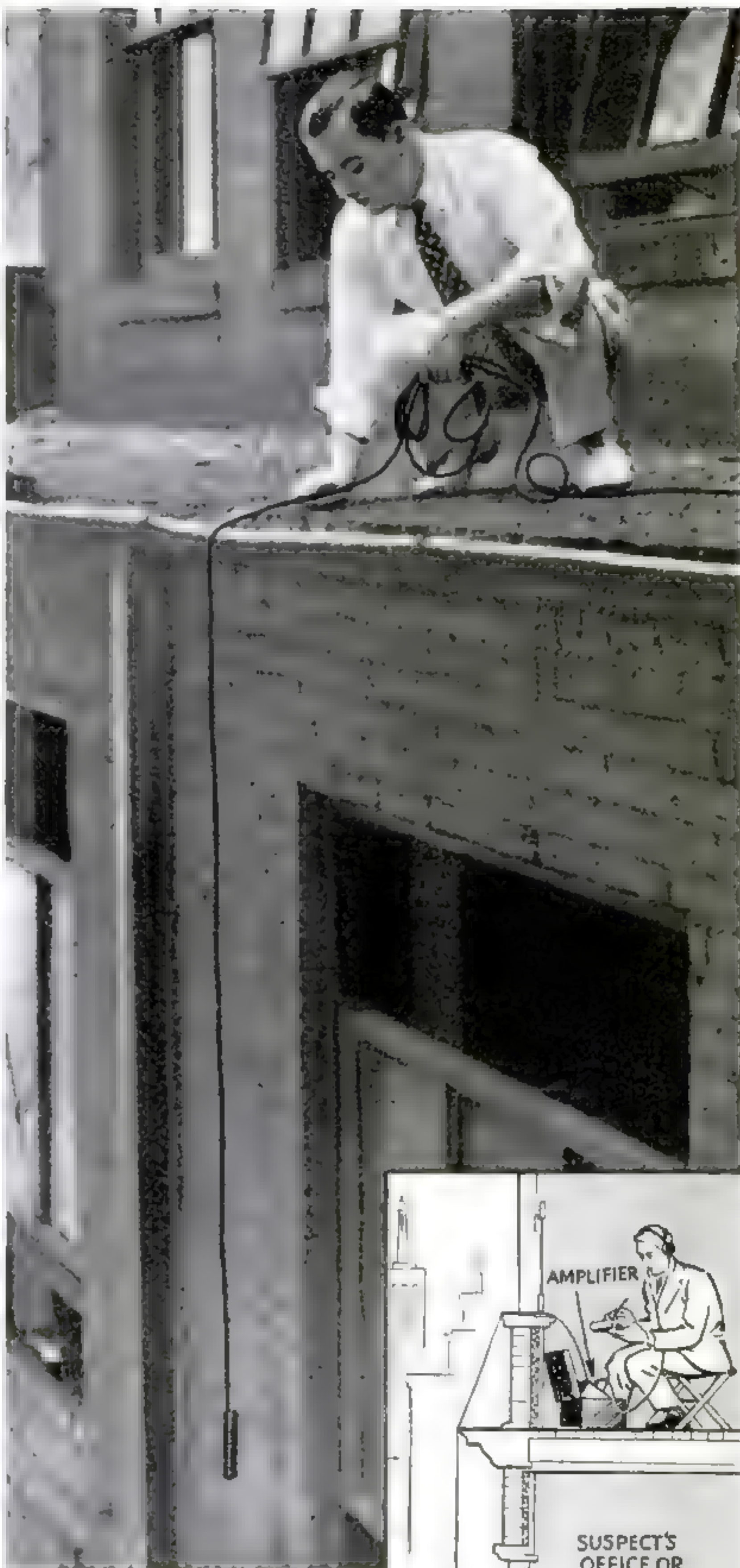
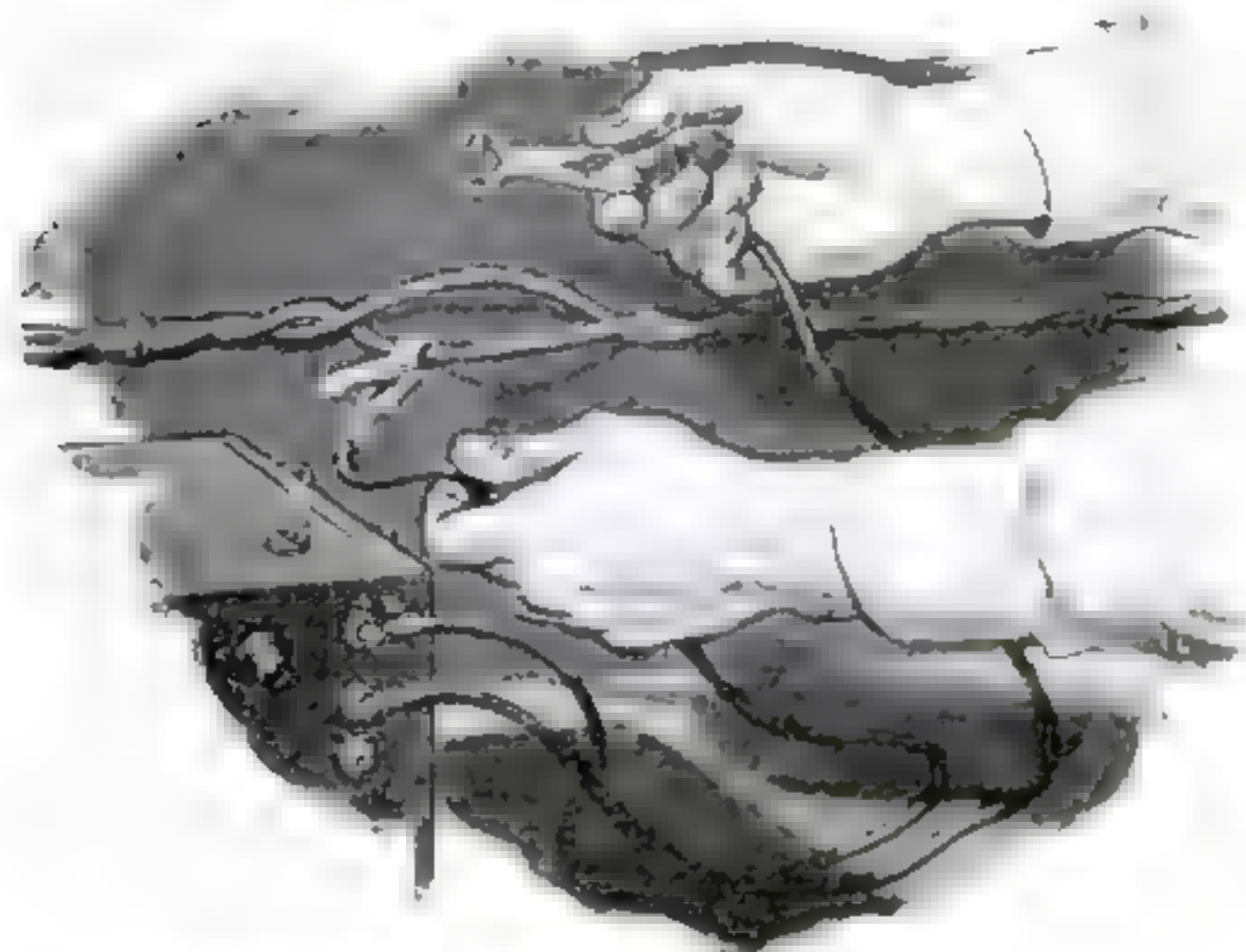
Occasionally, direct electrical contact with a criminal's telephone wire is necessary. Detectives now use a pair of specially designed clips fitted with sharp metal needles that penetrate the insulation and contact the copper wire, but leave no telltale marks when removed.

Telephone tapping, however, is not the only stratagem in the eavesdroppers' bag of tricks. When detectives can slip into a suspect's room while he is absent, they plant a tiny, supersensitive microphone under a desk, behind a curtain, or even within the earpiece of his telephone. With the latter arrangement, the concealed wire carries two-way telephone conversations, as well as sounds made in the room, to police.

If it is impossible to plant a "mike," wire-tapping experts still have an ace-in-the-hole in an ingenious contact microphone which can be attached to the wall between the suspect's and an adjacent room. Through any wall of ordinary thickness, the contact mike will pick up the slightest sound.

Evidence gained by any of these forms of electrical sleuthing are preserved in permanent form by the use of a portable sound recorder. Records of the damaging evidence can then be played back in court to help convict the unsuspecting criminal.

For actual wire-tapping, special clips have needle points that penetrate the insulation



LISTENING IN FROM ABOVE

If a suspect's telephone box is near an outside wall, a tiny induction-coil cylinder is lowered along the exterior of the building to pick up conversations, as pictured above and at right



Waterfall Gives Free Car Wash

NATURE provides a free car wash for motorists on a North Carolina highway. At Bridal Veil Falls, near Franklin, a stream of water trickles over a rock ledge and pours down on a section of the roadway below. The photograph above shows a woman motorist, clad in a bathing suit, taking advantage of the flow to mop off the dust and grime accumulated on her car, which she has placed directly in the path of the waterfall.

Vaporizer Works in Water Glass

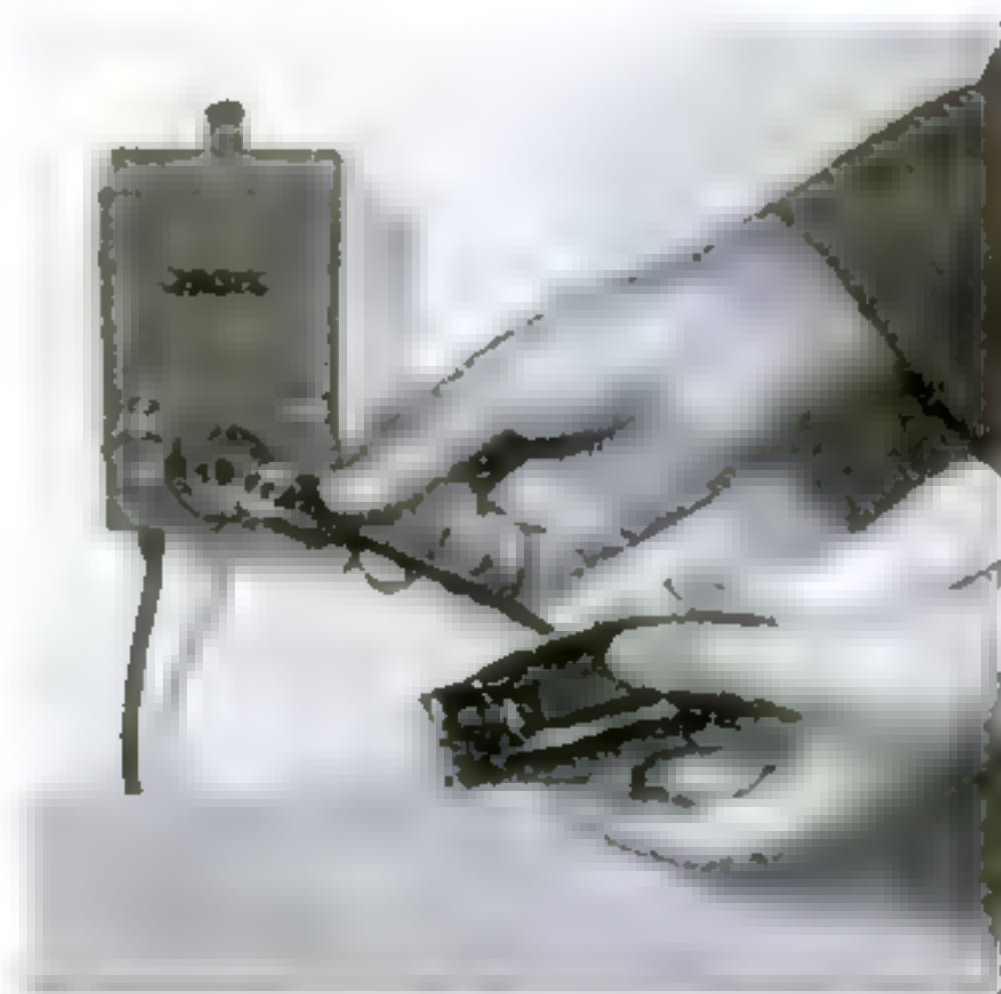
HUNG from the edge of a glass partly filled with water, an electric vaporizing unit now available produces a medicated steam for inhalation by those suffering from respiratory ailments. The unit can be plugged into any alternating-current outlet.



Electrically produced steam vaporizes medicant in top of the device

Adapter Unit for Electric Razor

ELECTRIC razors designed to operate on 110-volt current can now be powered by six-volt batteries in automobiles, boats, or trailers by employing a portable adapter unit. A similar unit can be used with thirty-two-volt current.



Razor plugged into the new adapter unit for use with six-volt current



Electric Shouter Aids Traffic Cops

MEGAPHONES equipped with battery-operated microphones and loudspeakers are now being used by British traffic police to control pedestrian traffic at busy street intersections. When jaywalkers dash out into the street against the light, the policeman shouts an amplified warning through his electric megaphone, as shown above.

People Who Read While They Eat Get Newspaper Table Lamp

A TABLE lamp now available has an adjustable, two-arm rack designed to support a newspaper at the proper level for reading while a person is having a meal. Now being installed on dining tables in hotels and restaurants, the lamp has an all-metal reflector shade fitted with a glass bowl that casts glareless light onto the newspaper. Flipping a base switch lights a red shade-top bulb to summon a waiter.



A rack attached to the lamp holds a newspaper in position for reading

Players Get a Kick Out of Odd Football Golf Game



PLAYED on a fourteen-hole course dotted like a golf links with roughs, traps, bunkers, and other hazards, a recently improved outdoor game first introduced by Dr. William Code, Chicago physician, combines features of soccer and golf. Players attempt to kick a twelve-ounce rubber ball, which measures six inches in diameter, around the course, putting it into the fourteen "bowls" or cups in consecutive order, as in golf. The bowls are metal containers shaped like a truncated cone. Par for the course is about seventy-five kicks.



Model ship in light bulb, and its maker



Model Maker Builds Ships in Electric-Light Bulbs

BUILDING model ships inside of old electric-light bulbs is the novel spare-time occupation of an English hobbyist. Slicing off the socket end of a large-size bulb, the model maker introduces his ship parts through an aperture less than two inches wide. When the ship model has been completed within the bulb, it is mounted on a base containing a battery that lights up a tiny lamp concealed within the little vessel.

Nonskid Toe for Football Shoe Gives Perfect Kicks

MADE of rubber, two inches wide and corrugated at the front edge, a supplementary toe which is strapped to a regulation football shoe makes it easy to obtain accu-

racy in kicking points after touchdowns, according to University of Southern California players who made fifty-nine placements good out of sixty attempted in a recent practice session. The shoe accessory was invented by Cecil Cushman, football coach at the University of Redlands, Calif. A close-up of the "sure-goal" shoe in use is shown in the photograph below. The bottom surface of the toe is cut away to allow the cleats on the player's shoe to protrude.



Howard Jones, University of Southern California football coach, examining the "kicking toe." It is attached to a player's shoe for placement kicks, as at right

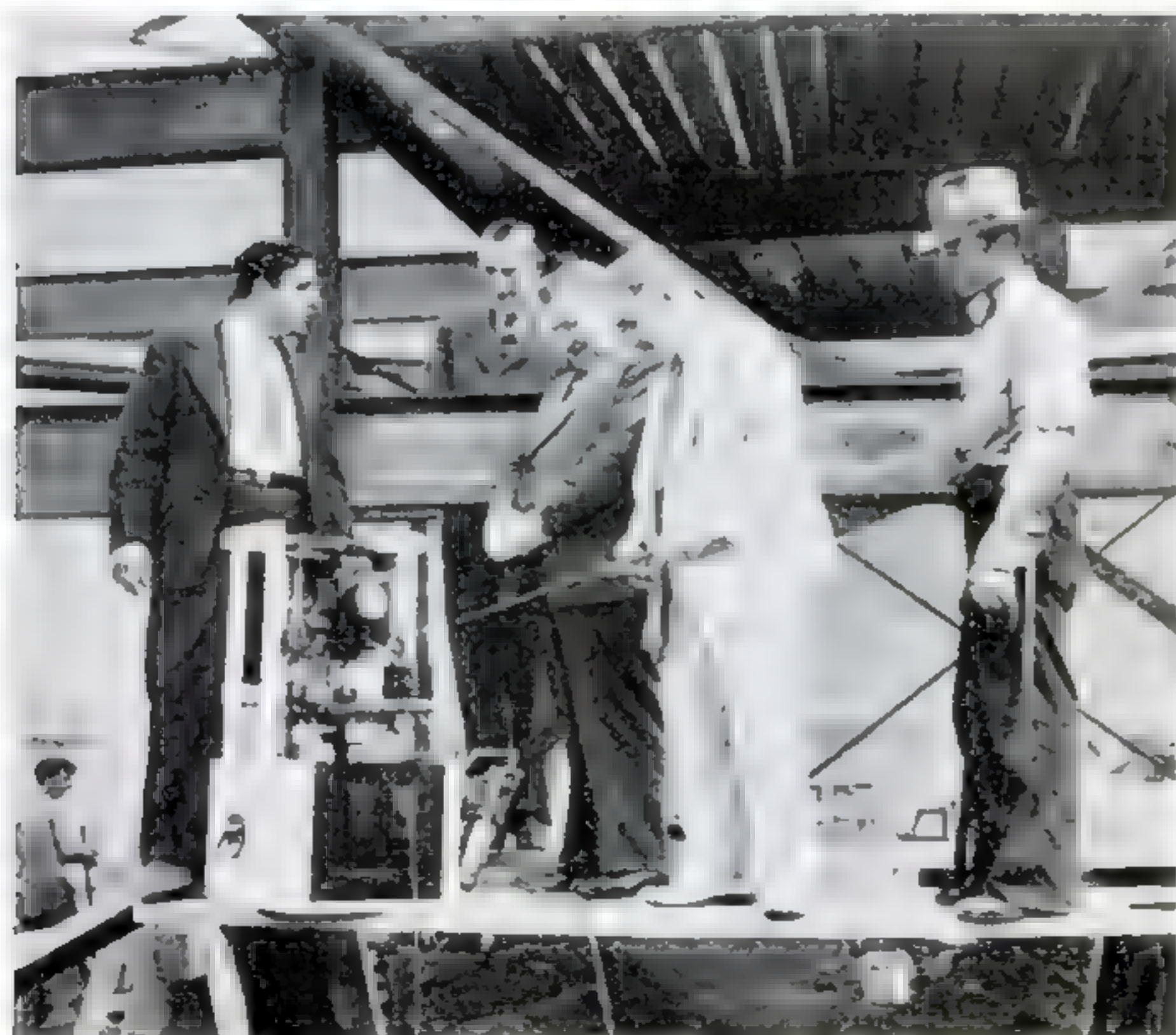
Corner Stone Is Made of Glass



To demonstrate the use of a type of structural glass that is laid like brick, a "corner stone" of glass has just been set in place for a building rising in New York City. Similar glass bricks will be used in the walls of the building, which will house an exhibit of the history of glass from earliest times up to now.

Radio Waves Heat Last Rivet for World's Fair Building

RADIO waves received one of their strangest applications when they were recently used to heat the last rivet for the New York World's Fair exhibit building of the Radio Corporation of America. For the demonstration, engineers set up the oscillator unit of a standard radio transmitter. Its output, which customarily would be directed into an antenna, was led instead to a coil of wire and produced a concentrated field of radio waves at the center of the coil. When the rivet was held in this field for a little more than a minute, it became white-hot, and was then driven in place. While not yet practical for ordinary construction work, the method was declared suggestive of possible uses of radio.



Officials watching a rivet turn white-hot in a field of radio waves



Wreck Hung in Tree Is Odd Danger Sign

HANGING high in a tree, a battered automobile warns passing motorists of danger on a southern highway. After towing hundreds of wrecks from this particular section of road, B. A. Pietri, a garage mechanic of Wilson, N. C., devised the eye-catching "signpost." His wrecking crew hoisted the ancient car forty feet above the ground, leaving it anchored firmly in place as a permanent reminder to drivers.

Preserving

"CRYPT OF CIVILIZATION"



The entrance to the crypt is behind the draped flag on the building. It is seen close-up in the picture above

THE YEAR is 8113. Spired cities built by the ancient people of the twentieth century have long since crumbled to dust. Of the airplanes and automobiles in which they traveled, not a rusted scrap remains. Their perishable tools, utensils, books, magazines, and newspapers have vanished completely. What learning they possessed is but dimly known. But where Oglethorpe University once stood, in what was Atlanta, Ga., a band of archæologists has just un-



Dr. Thornwell Jacobs examines photographic film that is to be sealed in a preservative gas and deposited in a vault on the campus of Oglethorpe University, in Georgia, as a part of a unique record of our civilization. The idea is that the crypt will not be opened until the year 8113 A.D.

earthed a door of stainless steel. They break it open—and find themselves in a treasure house of the past. Pictures and records, perfectly preserved through the ages, tell them in every detail the long-forgotten story of what life was like in 1938.

That is the romantic, breath-taking vision that is taking practical form at Oglethorpe University today. Into a crypt as large as an average living room, hollowed out of the granite bed rock beneath the campus and

Our History in a Tomb

WILL RE-CREATE OUR DAILY LIFE FOR PEOPLE OF 8113 A.D.

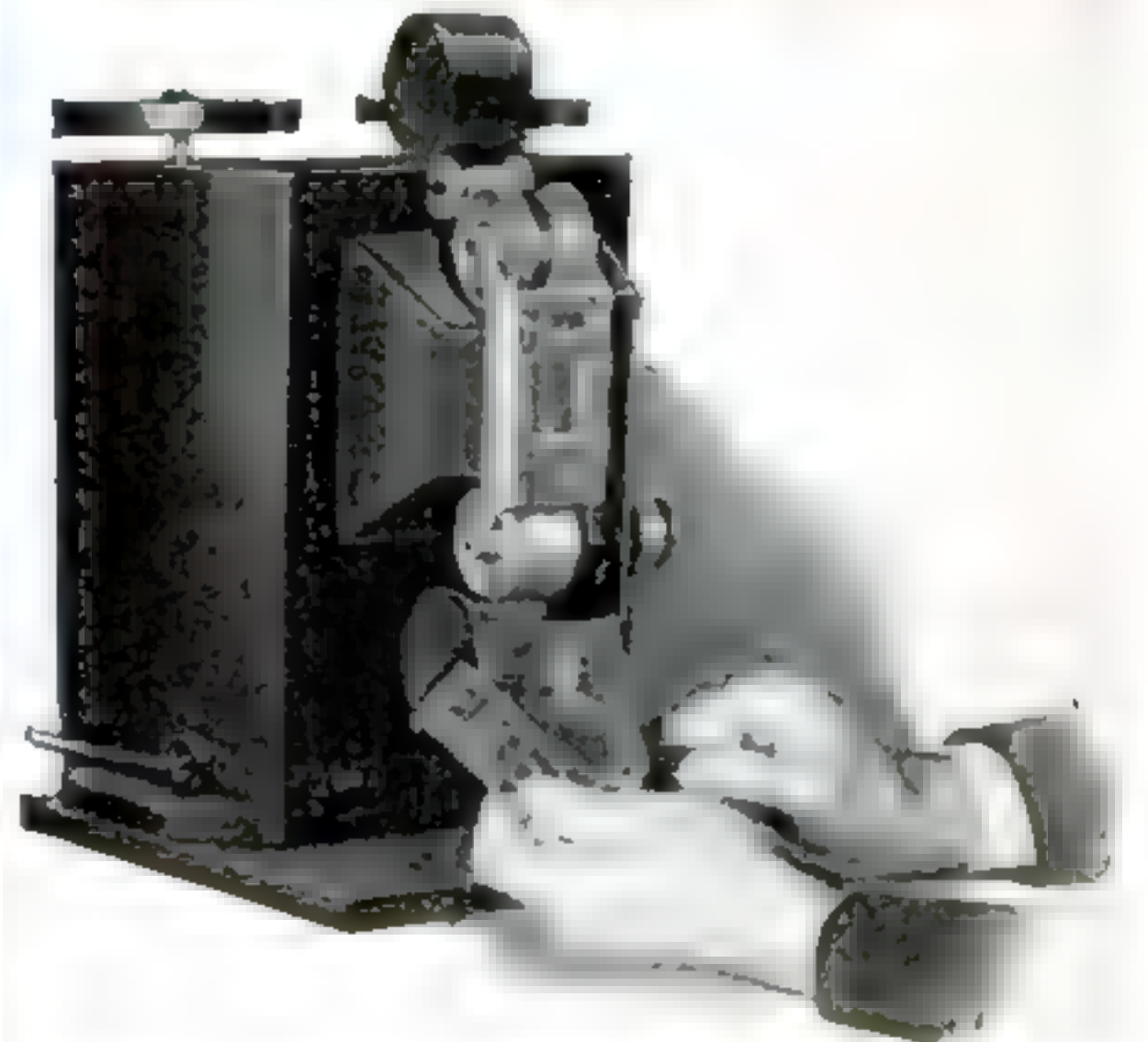
lined with walls of gleaming chromium, experts are stuffing motion-picture films, copies of present-day encyclopedias, textbooks, works of art, and models of machines that will give future historians a complete picture of their distant ancestors.

When the crypt is filled, the air in it will be replaced with inert nitrogen gas, and it will be sealed against the ravages of the ages. Graven in a plaque upon the stainless-steel door, a message will direct that the vault be opened in 8113—a date chosen because it is as far in the future as the first recorded date in history, the beginning of the Egyptian calendar, is in the past.

For the first time, points out Dr. Thornwell Jacobs, president of the university and originator of the project, the art of copying books and pictures in reduced size on movie film permits storing a vast bulk of priceless records in limited space. Duplicate "microfilm" copies of volumes for the Georgia vault are being made

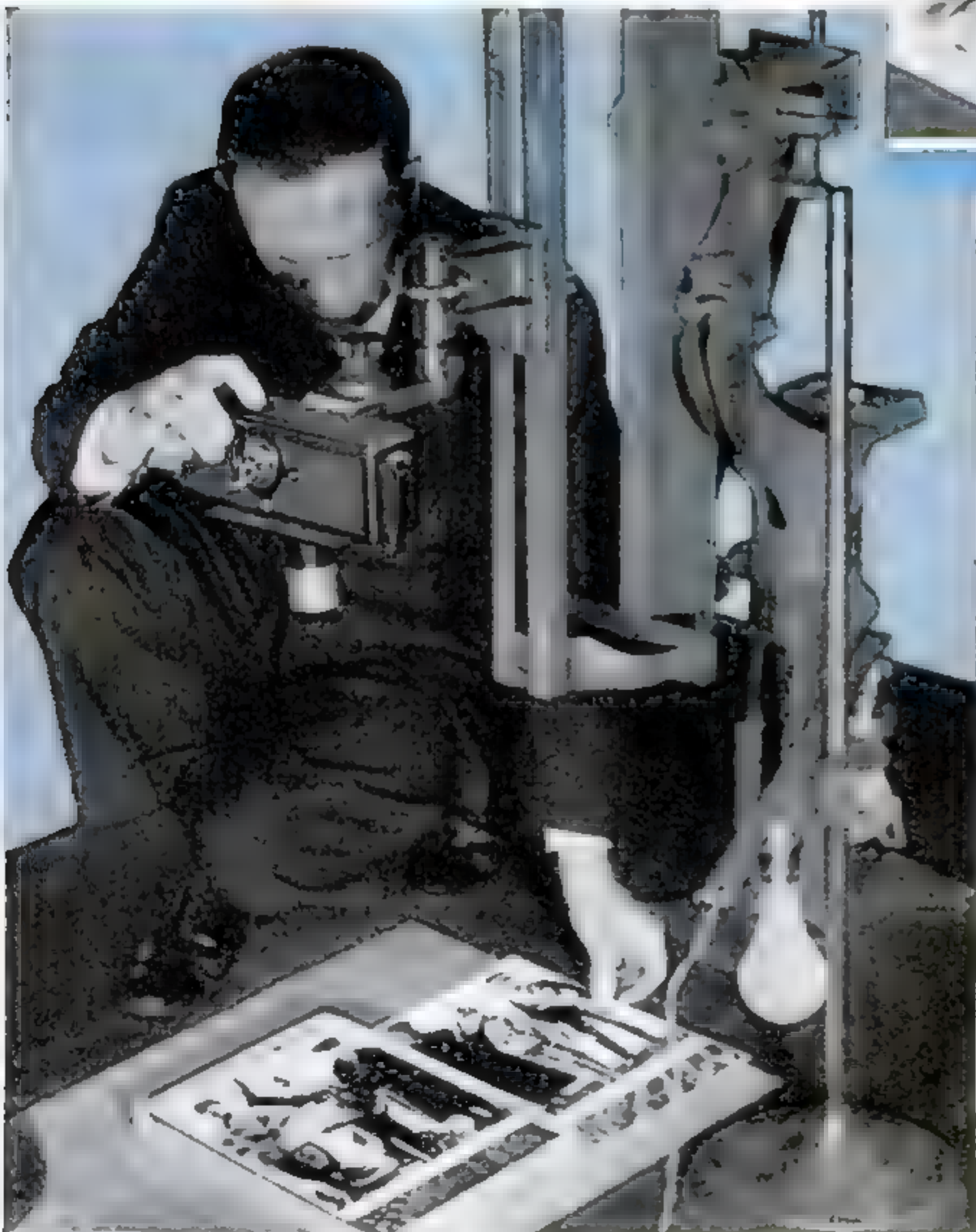


A co-ed contributes the contents of her purse for the edification of future ages



Metal photographic film and projector that may re-create present-day American life for people who will live 6,000 years from now

At the left, T. K. Peters, director of archives of the university, preparing an encyclopedia on film by copying photographs of persons and scenes of our modern world



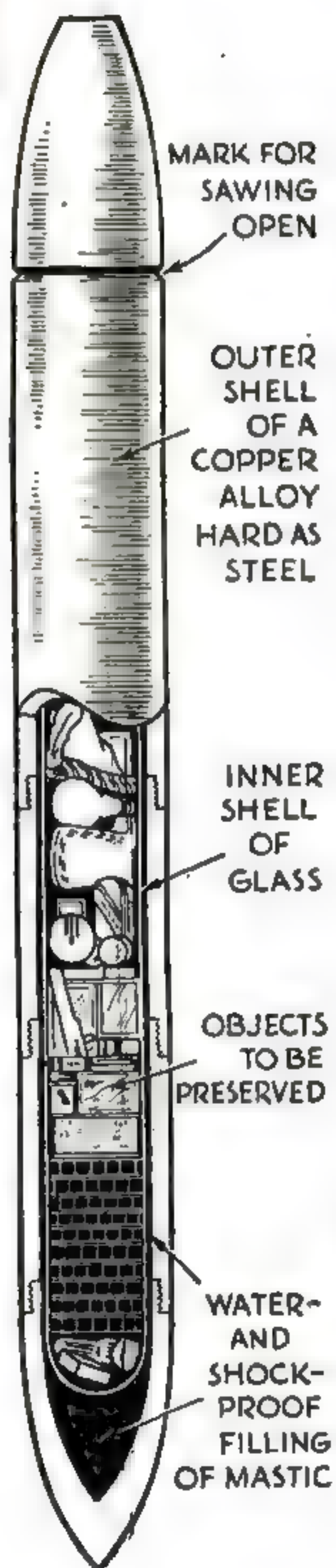
"Time Capsule" Buried Under World's Fair



Here our artist gives his conception of the scene in the year 6939, when archaeologists will unearth this record of our way of life

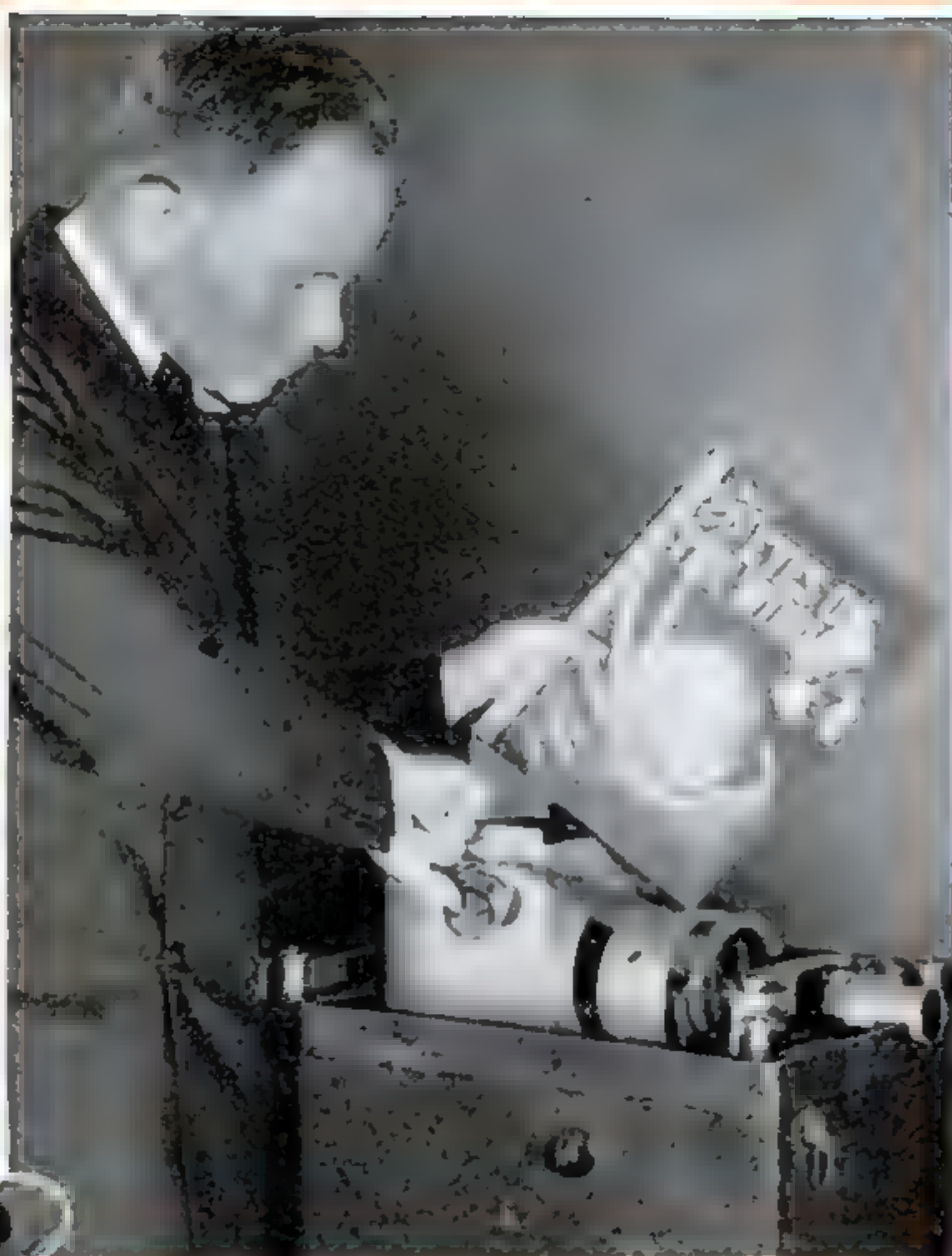


Another scheme for "canning" our civilization employs the "time capsule" seen at the left. A cylinder of time-resisting alloy, packed with microfilm records, is buried under the grounds of the New York World's Fair



WHILE preparations go forward for the Georgia crypt, a torpedo-shaped "letter" addressed to posterity has just been buried fifty feet deep at the site of New York's World's Fair by Westinghouse engineers, who expect it to be rediscovered thousands of years hence. Seven feet long and weighing 800 pounds, the "time capsule" holds a cross-section of modern achievements in science and art, recorded on microfilm. It also contains the secret of hardening copper—the formula for "cupaloy," a new copper-chromium-silver industrial alloy of which the receptacle itself is made.

Hundreds of books are being copied on film. Here an original book is being compared with the photographic version made to go into the crypt



The Rosetta stone of the future—a device that will give, in sound and pictures, a key to the English language as we speak it now

upon standard cellulose acetate film and upon tissue-thin metal film, a new invention that is believed still more durable. To prepare it, the image of the negative is etched into stainless steel, nickel, or copper by photo-engraving methods. An inlay of another metal, such as platinum, is then deposited in the etched portions. The result is an indestructible picture on metal in black upon a white background.

Five rolls of film, surrounded by inert gas, are sealed in a glass tube. Protected by a layer of asbestos, the tube in turn is placed in a seamless receptacle of stainless steel, a foot long and four inches in diameter. The receptacle itself is inclosed in a ribbed casting of extra-strong alloy, capable of resisting a crushing force of thousands of pounds. Row upon row of these receptacles will line the metal shelves of the crypt. Barring accident, their contents should be found in perfect condition after sixty centuries!

Suppose the location of the vault is for-

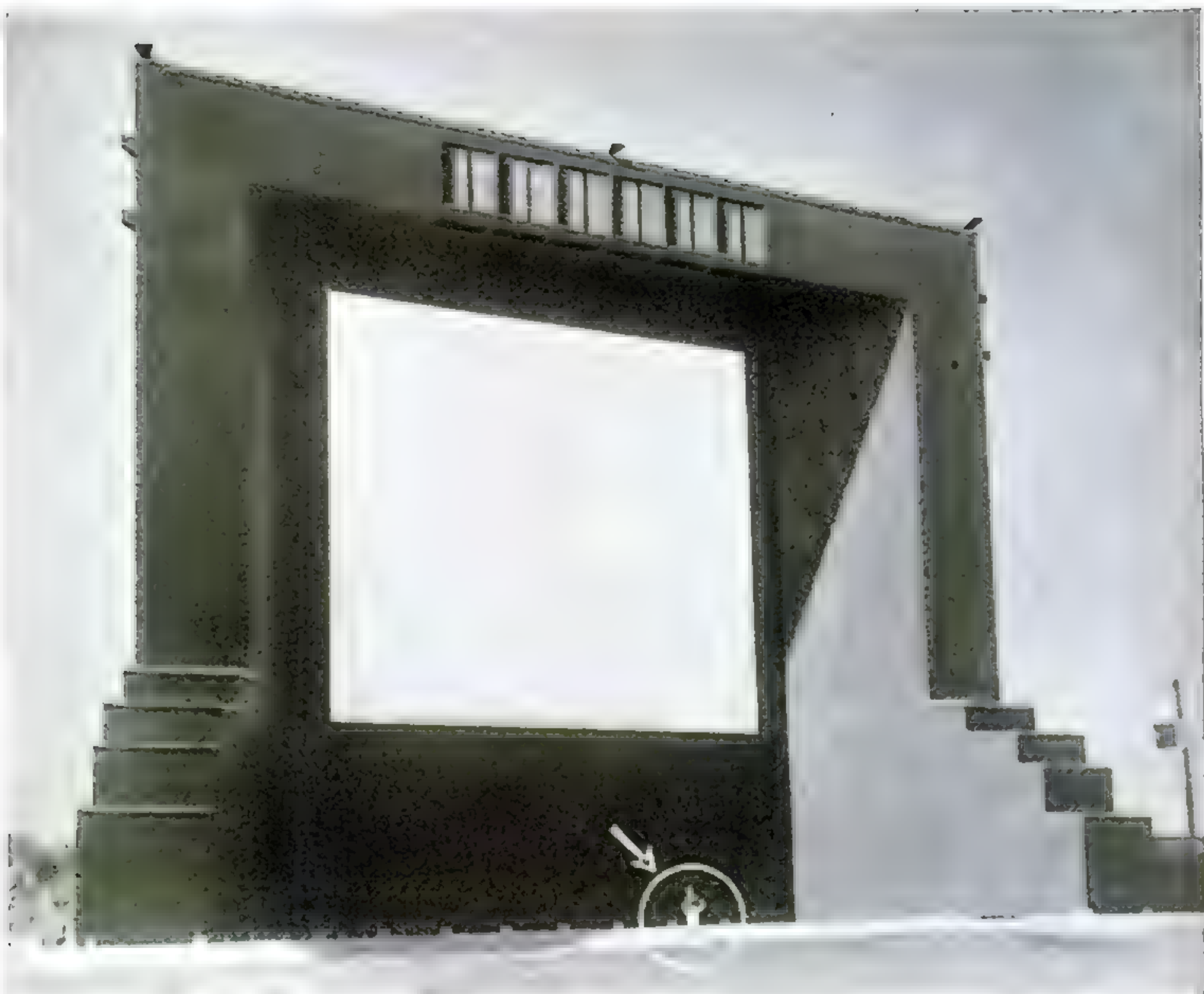
gotten with passing centuries? Descriptions of the deposit, engraved on metal, will be placed in all the great libraries and museums of the world, and even in such out-of-the-way places as monasteries in Tibet and temples in China and India! Some one of these clues will almost inevitably be discovered.

If English is an unknown tongue by 8113, how can the records be deciphered? The first thing to meet the eye of a person entering the vault will be a movie machine of the pioneer "mutoscope" type, with the addition of a phonograph attachment. Turning a crank reveals one of

3,000 metal plates, bearing, say, a picture of an apple and "APPLE" in print. Sound apparatus then pronounces the word.

Since no one knows what sort of electric current people will use in 8113 A.D., if it is available at all, a windmill generator will provide current for the electric sound-film projector.

Records to be stored away will include sound films of the voices of present-day leaders, stereoscopic photos of all the world's masterpieces of sculpture, a year-by-year history-in-pictures of the United States for the last 100 years, and the world's greatest masterpieces of poetry. Models will show every essential kind of modern tool and machine, household utensils and tableware, and great engineering feats. A complete set of costumes for men and women will be preserved in helium gas. There will be cook books, histories, science textbooks, and books of practical instruction in mechanics, engineering, and all the arts and manufactures. Two POPULAR SCIENCE handbooks are to be included. Supermen of 8113 may be chagrined to find that some of their inventions were anticipated as early as the twentieth century. Or, if world war or some natural cataclysm has made mankind revert to a barbaric state by that time, the "lost arts" preserved in the Georgia crypt might conceivably start the race back along the road to civilization.



World's Biggest Movie Screen for Outdoor Theater

SAID to be the largest in the world, a \$30,000 moving-picture screen has turned part of an abandoned airport at Valley Stream, N.Y., into an outdoor "automobile" theater. Of

such huge dimensions that it dwarfs the man in the photograph above, the screen is supported by a five-story structure containing more than fifty tons of steel girders. Special high-power projectors throw the films on the screen, while directional loudspeakers carry the sound to the audience sitting in automobiles parked on a series of ramps.



This movie money not only looks real, but sounds real

Hollywood's "Mint" Makes Stage Money

"STANDING IN" for real coins and currency, the bills and coins shown piled on the table at the left are part of the vast amount of stage money made each year for motion-picture-studio use. Presses roll out thousands of bills of every denomination, representing both U. S. and foreign money, while coins are stamped from special alloys that make them sound much like silver when they are jingled.

Boy Chemist "Eats Up" Course in Foodstuffs

RELATIONSHIP between the fields of chemistry and cookery is the research project that interests seventeen-year-old Edgar Friedenberg, the youngest man ever to appear on a program of the American Chemical Society. Friedenberg is pictured below taking time off from his studies in synthetic foodstuffs to try a little practical work with the frying pan.



Edgar Friedenberg, student of the chemistry of foodstuffs, does some practical research



Race Horse Gets Air Intake

WHEN a respiratory ailment interfered with the racing of Peter Song, five-year-old trotting horse, Dr. Harold Lewis of Nashua, N. H., performed an operation that gave the trotter an extra windpipe. A metal tube connected to the animal's throat was inserted through a hole cut in his neck. Plugged under ordinary conditions, the tube is opened just before a race, two of which the horse has won since his operation.

Hand Set for Television Uses Midget Screen

NICKNAMED a "television monocle," a miniature unit recently on display at an exhibition in London, England, is a complete sight-and-sound receiving set. Shaped like a hand-type telephone, the apparatus has an earphone through which the user hears the sound accompanying a televised broadcast while watching the moving images flash across a small built-in screen, two inches wide, placed so that it is directly before the eyes. The instrument, which weighs just under two pounds, can be used even in a lighted room with good results, it is said. An exhibition visitor is shown at the right trying out the television hand set.

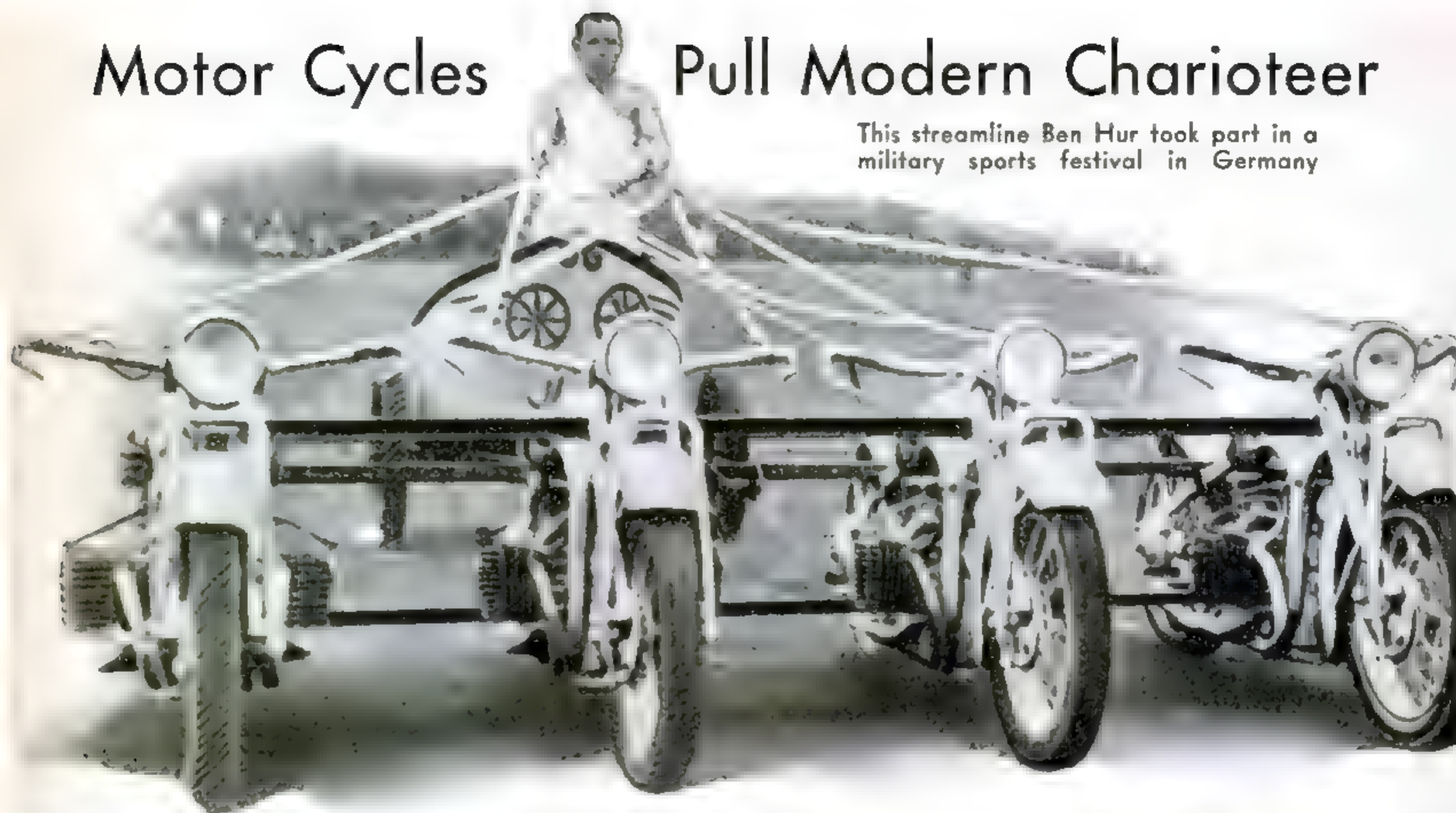


"Television monocle" in use. It works like a hand phone set

Motor Cycles

Pull Modern Charioteer

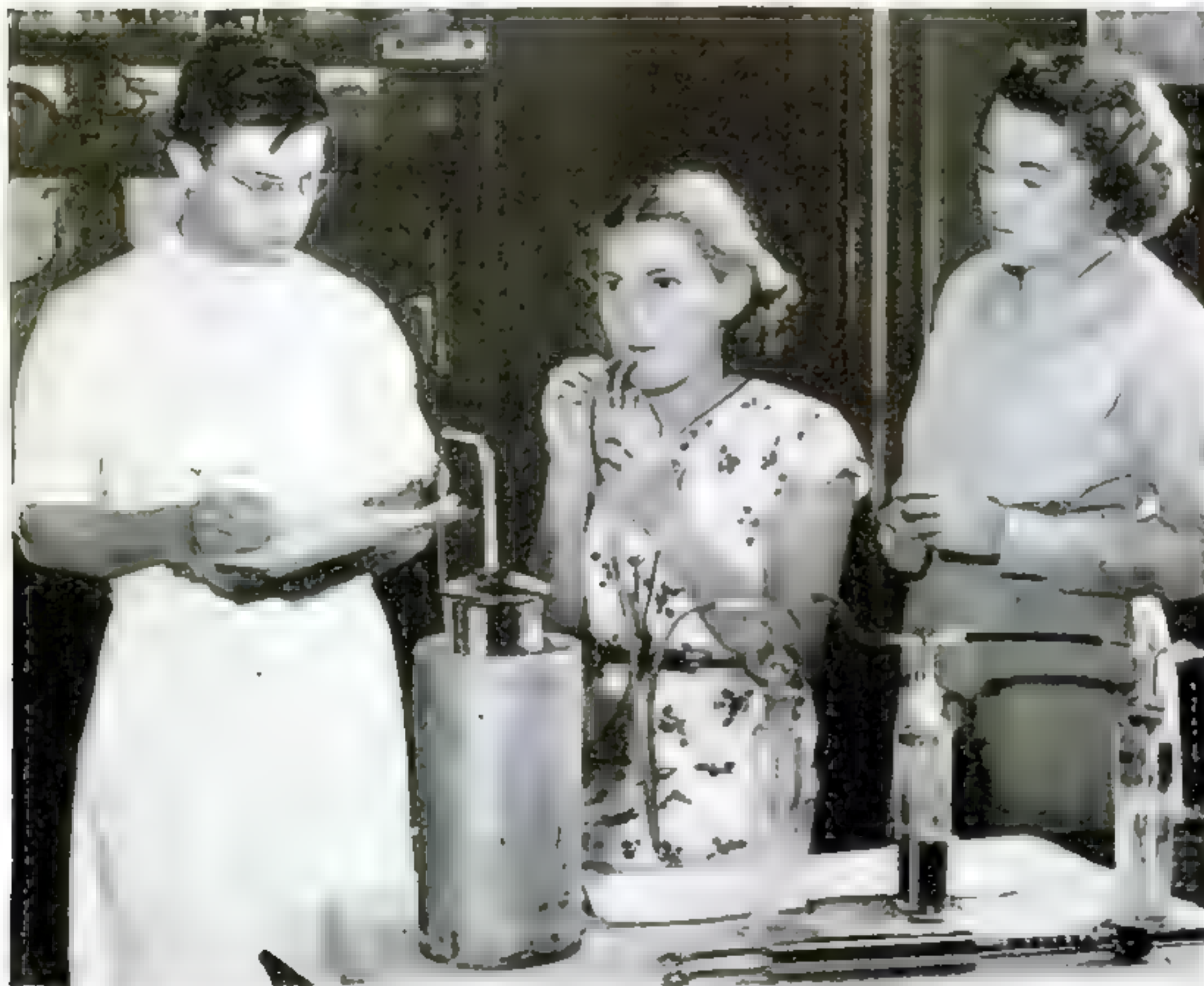
This streamline Ben Hur took part in a military sports festival in Germany



MOTOR CYCLES took the place of horses in an odd chariot event which was a feature of a sports festival held by German soldiers at a regimental barracks in Berlin. As pictured in the photograph above, a rubber-tired, two-wheel chariot, was harnessed

behind a quartet of motor cycles that were held upright and apart from each other by means of crossbars. Reins attached to the handlebars of the riderless cycles enabled the chariot driver to guide his unusual team around the course.

Halitosis Clinic Studies Causes of Bad Breath



A subject breathing into an apparatus that freezes organic substances in the breath for analysis by the osmoscope, which is seen lying on the table

TO DISCOVER the cause and cure of offensive breath in human beings, a novel halitosis clinic has just been set up at the Northwestern University Dental School in Chicago, Ill. Patients exhale through their mouths into a tube kept cold enough to solidify organic substances in the breath as they pass through. The frozen mass is then liquefied and tested by means of an osmoscope, an instrument shaped like a piccolo, which measures the concentrations of odors. Tests made so far indicate that offensive breath is most noticeable in the morning and that it tends to increase in concentration with advancing age.

Odd Golf-Bag Chair Rests Player's Feet

SO THAT he could rest comfortably while waiting for other players to make their shots, Dr. J. H. Harris of New York City used a novel combination golf bag and chair during a recent tournament at Garden City, N. Y. As shown in the photograph at the right, the collapsible seat has a hollow back that accommodates a full set of clubs, and a strap for carrying.

Potato Skins Yield Cork Substitute

POTATO skins, pressed into sheets and dried, form a satisfactory substitute for cork, according to a report by a German chemist. Remnants of potato clinging to the skins are first removed, after which the material is rolled into plates. When dried, the product is said to resemble natural cork.

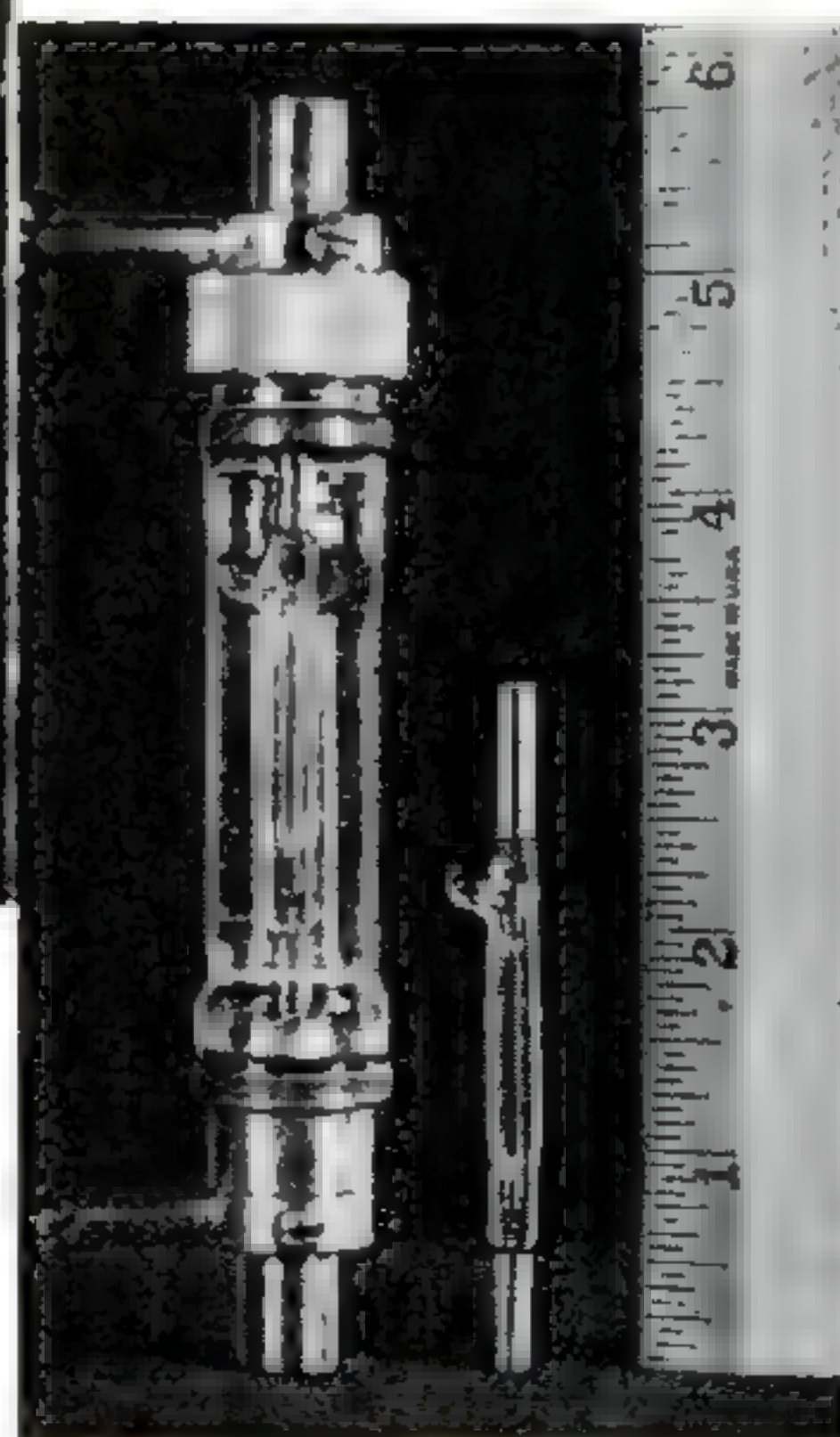


Dr. J. H. Harris using his combined golf bag and chair on the links

Water Jacket Cools Midget Arc Lamp



Left, laboratory workers shield their eyes from the "vest-pocket sun," seen below with and without its protective cooling jacket



NOW ready for commercial use in photo-engraving work, blueprinting, searchlight operation, and other fields, a midget arc lamp that operated experimentally when submerged in water (P.S.M., Apr. '38, p. 44), has been mounted in a quartz tube surrounded by a cooling water jacket. Less than six inches long, the tiny lamp gives off a brilliance equal to one fifth the surface brightness of the sun, and much whiter than that of ordinary mercury-vapor arc lamps.

Classroom to Job



By KENNETH
M. SWEZEY

Below, an instructor shows some of the tricks of the metal-working trade to a pupil in making a wrought-iron magazine rack



Millinery students at the Needle Trades High School in New York City. Girls learn to design and make hats



A class in stone-carving is seen at the left. The boys in the picture are learning to "point" work, or fill in cracks with mortar or cement. Graduates can get good jobs



The rug that these girls are inspecting is a product of their own class in rug-making



Youthful craftsmen turn out well-made furniture

In New York City's Vocational High Schools, 50,000 Boys and Girls Are Learning Trades That Will Enable Them To Start Out as Skilled Workers When They Are Graduated



A scene in the shop of the Manhattan High School of Aviation Trades, one of the most popular in the vocational system. Students work with real airplanes

WITH meat cleavers and rolling pins instead of pencils, and with chopping blocks, pastry boards, and steam tables for desks, the only public school of its kind in the world has just opened its doors to a long waiting list of eager students.

In this Food Trades Vocational High School, in New York City, 400 boys and girls still study English and mathematics, civics and personal health. But instead of cramming Homer and Virgil, they spend three hours a day baking muffins and meringues, carving porterhouse steaks, operating a cafeteria, learning to select, prepare, serve, and merchandise food. When they have completed the required four years' training, students not only will have acquired a good general education, but they will be able to step out into jobs as butchers, bakers, food merchants, chefs, or restaurant workers.



Class work in automobile repair. Two whole schools are devoted to the automotive field

Strange as it may seem, this school is only the newest, rather than the most unusual, in an amazing system of vocational high schools and courses created by New York City's Department of Education in recent years. In these schools, boys and girls study almost every imaginable industrial or commercial



In this model cafeteria, the boys and girls prepare all the food and serve it to teachers and fellow students



Cakes like Mother used to make are the goal of the boys at the left, who plan to make baking their life work



Barber college would be postgraduate work for these little shavers

craft—from barbering and beauty culture to airplane mechanics and commercial photography; from dress manufacturing and tailoring to stage design and scientific farming.

The food-trades school caters to students from the entire city. Seven other central schools include schools for printing, aviation, automotive, electrical, and needle trades, commercial education, and industrial art.

Manhattan High School of Aviation Trades is one of the busiest. Here 2,500 boys work six hours a day assembling and repairing airplanes and engines, and studying subjects related to the industry. Postgraduate courses are offered in aircraft inspection, welding, and airplane radio. So good is the students' work, that the school has been made an approved repair sta-

tion, under authority of the U. S. Bureau of Air Commerce.

The New York School for Printing Trades trains linotype operators, pressmen, bookbinders, and printers' apprentices. It is especially proud of its course for newspaper pressmen, which boasts a high-speed rotary newspaper press, donated by the New York "Times"—the only press of its kind in any printing school in the world.

In the School of Industrial Arts, crafts as old as stone carving, jewelry making, and marionette operation are taught side by side with commercial photography, silk-screen printing, and modern stage-scenery design. A unique specialty of this school is a large marionette theater, for which students make puppets, design scenery, and arrange lighting, and in which they finally present several elaborate performances each season. Although this work is part of a larger course in window display and stage design, a number of students have already found jobs as professional puppeteers.

For trades that are not taught in a central school, there are sixteen "general" vocational schools that teach everything from barbering, sailing, and fixing home radios, to making false teeth, improving your personality, and raising children.

One of the oldest and most successful vocational courses in the city is given by the Farm School of Newtown High School, on Long Island. This was founded in collaboration with the Federal Government, in 1917, as a food-conservation unit. Today the school owns a fifty-four-acre farm, with orchard, vineyard, barns, greenhouses, brooders, and modern farming machinery. The first two years of the course are devoted to dirt farming, the students plowing, planting, and raising all the fruits and vegetables of a Long Island truck farm. They also learn to breed and raise chickens, rabbits, and ducks. The remaining two years are spent chiefly at the main school building, studying soils, crops, agricultural economics, and farm management. Eggs, poultry, and vegetables are bought up quickly by students and parents, and the money is returned to a rotating fund used to help support the course and buy new equipment.

The finding of jobs for graduates is as important in this vocational system as is the training of students to fill them. To this end, each school has a placement bureau which keeps in constant touch with the industries its courses serve. Because every course is planned to fill a definite trade demand, there is normally a waiting list of vacancies for graduates, with industry bidding for their services.



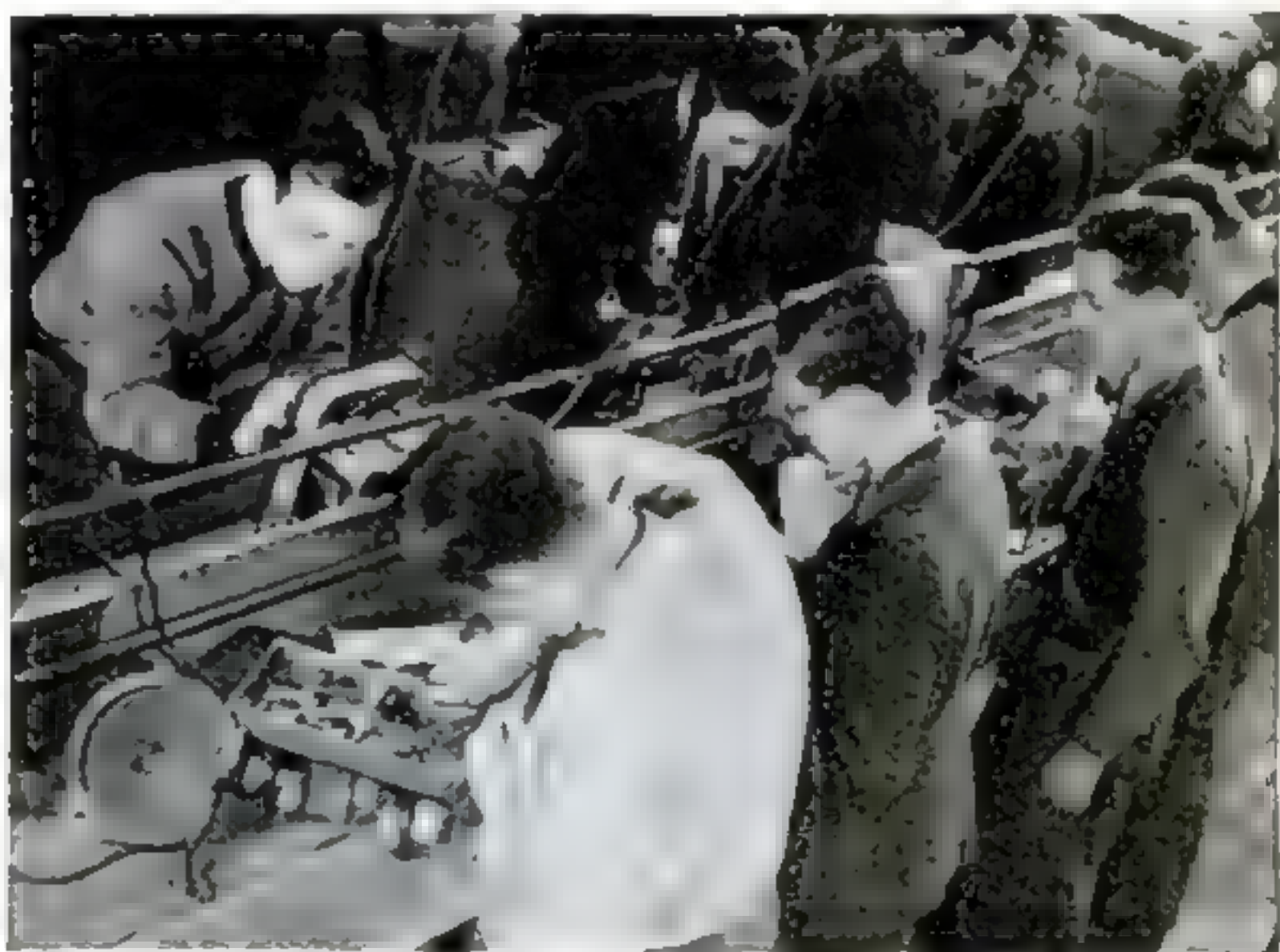
Boys operating job-printing presses in a school which owns a big newspaper press



Right, a student of dental mechanics gets a few pointers



Training in commercial photography includes practice in camera work, copying, photo finishing, and retouching



Radio workers in the making. In classes like this, boys learn the design, construction, and repair of modern sets



Oxygen equipment for high-altitude use under test in the vacuum tank by air-line hostess and engineer

"Stratosphere" Chamber Tests Plane Equipment



REPRODUCING atmospheric conditions 65,000 feet above the earth's surface, a stratosphere chamber is now in use for altitude research by United Air Lines experts in an experimental laboratory at the Chicago, Ill., municipal airport. The steel pressure chamber is built in cylindrical form, five feet long and four feet in inside diameter, with pressureproof glass portholes at the sides, ends, and in the top. By evacuating air from

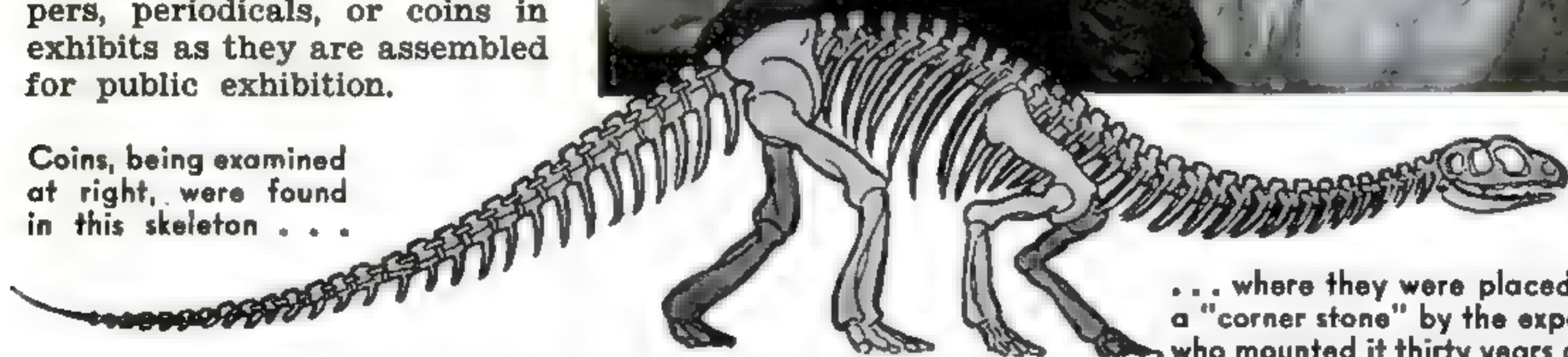
the chamber, conditions equal to those found twelve miles up can be produced to test oxygen apparatus, radio performance, and the effects of high altitude on the flavor of foods.

Ancient Museum Skeleton Pays Dividend—in Cash

FIVE U.S. Indian-head pennies were recently recovered from the backbone of a gigantic brontosaurus, a prehistoric monster whose skeleton has been on exhibition for three decades since it was first assembled at the American Museum of Natural History, in New York City. The mystery of how twentieth-century coins could have become embedded in the bones of a prehistoric monster was explained by museum authorities, who stated it is generally the custom among museum workers to place "corner stones" such as newspapers, periodicals, or coins in exhibits as they are assembled for public exhibition.



Coins, being examined at right, were found in this skeleton . . .



. . . where they were placed as a "corner stone" by the experts who mounted it thirty years ago



Baskets Hamper Bicycle Racers

PEDALING a bicycle while carrying five bushel baskets, one of them over his head, was the odd handicap imposed on each contestant in a novel race at a recent English sports carnival. The contestants, grocery-store delivery clerks, were warned against adopting this riding style for daily use.



Barney Connett about to submerge in his eleven-foot underwater boat. An electric motor runs it

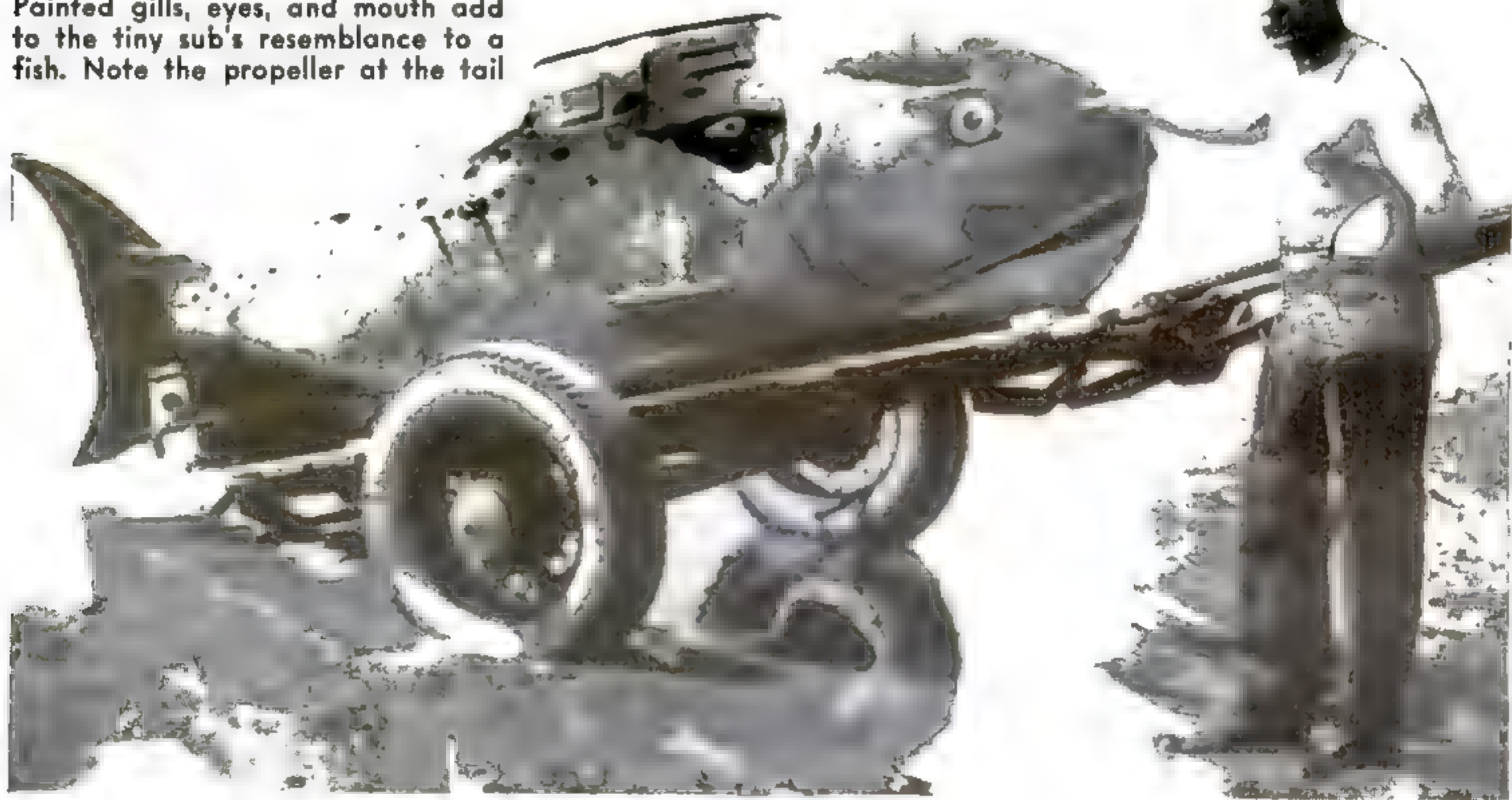
Tin Fish Is One-Man Submarine

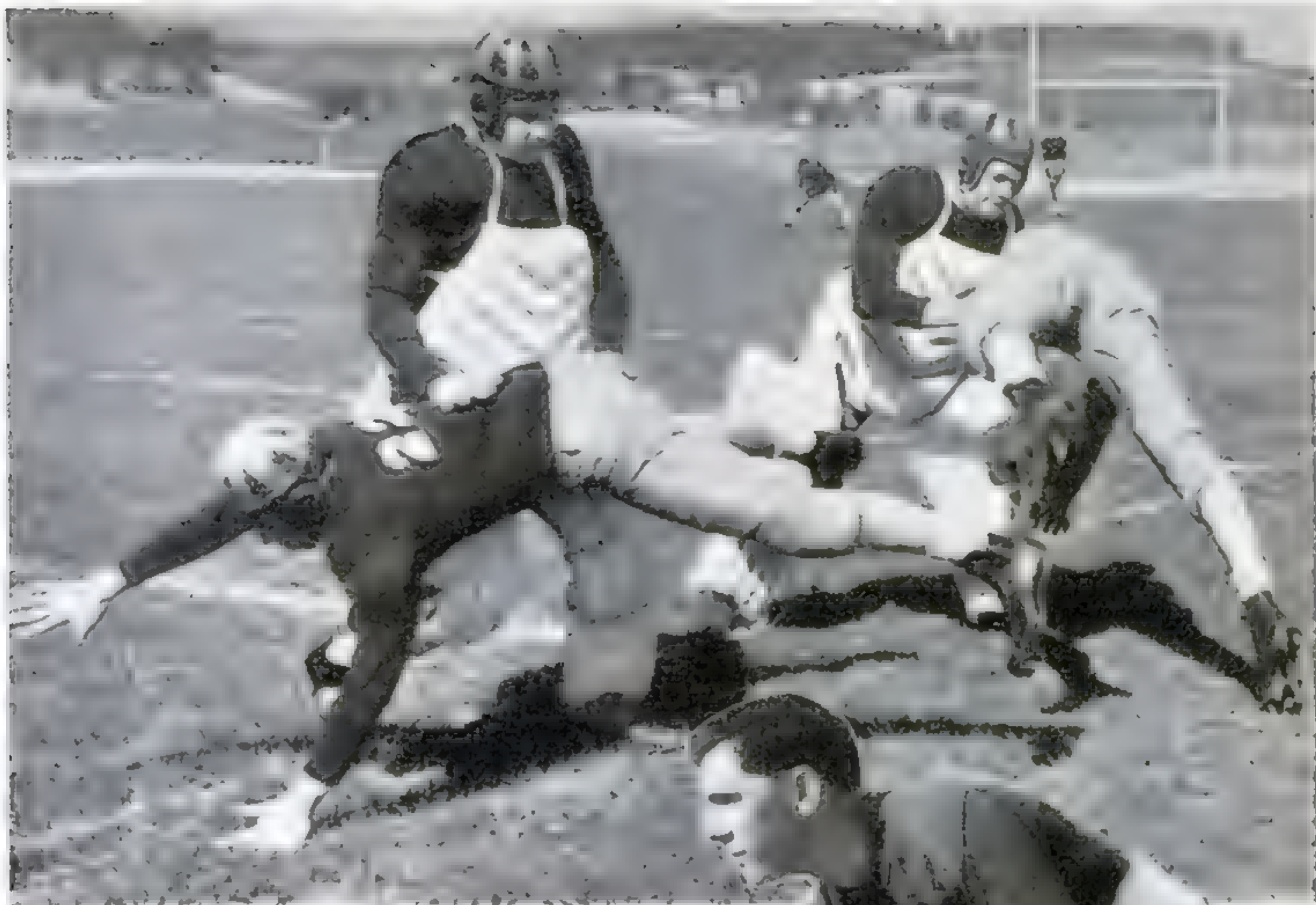
UNDERWATER FLIVVER DIVES THIRTY FEET, MAKES FOURTEEN-MILE RUNS

SHAPED like a fish, a one-man, homemade submarine built by Barney Connett, of Chicago, Ill., is believed to be one of the world's smallest underwater boats. Shorter than the average canoe, the craft measures twenty-three inches at its widest point and is thirty-seven inches high. Painted gills and eyes heighten the fishy look of the ship, which has a stabilizing tail fin surrounding its propeller. Fitted with conventional submarine equipment, including blowers, oxygen-supply

apparatus, air pumps, and a respirator, the tiny submarine is powered by two sets of electric storage batteries. Connett has made over 300 trips in his queer craft, diving to depths of over thirty feet and navigating under water for as long as fourteen miles at a stretch. Normally, the boat runs about three feet below the surface as its one-man crew navigates by means of a four-foot telescoping periscope that sticks up out of the water.

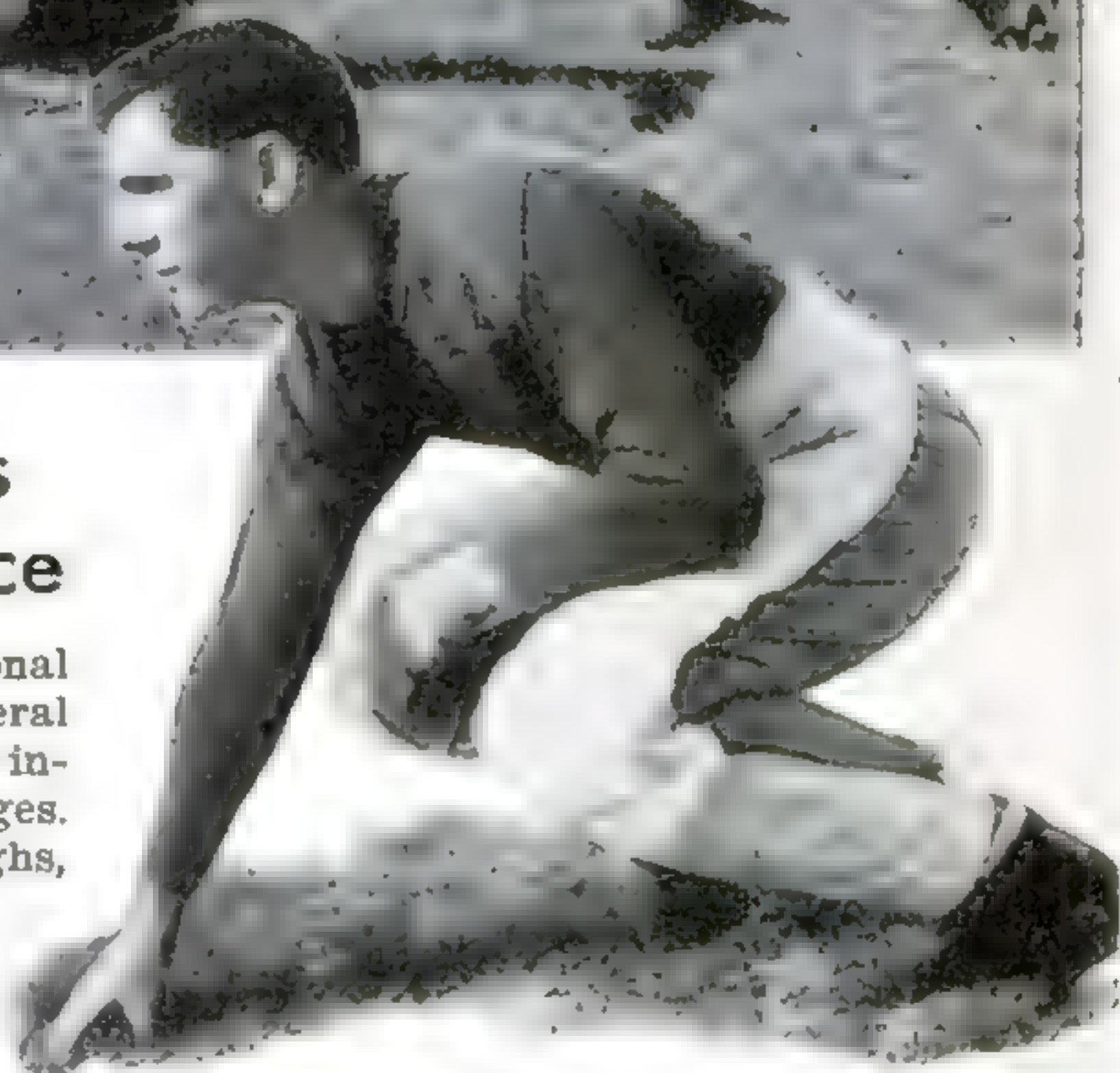
Painted gills, eyes, and mouth add to the tiny sub's resemblance to a fish. Note the propeller at the tail





Apronlike Football Pads Guard Players in Practice

AUXILIARY pads worn over the conventional football uniform are being used at several eastern schools and universities to prevent injuries to players during practice scrimmages. Particularly designed to protect the legs, thighs, stomachs, and chests of defensive ends and backs who are subject to repeated blocking by opponents, the apronlike pads resemble the chaps worn by cowboys. Although thickly padded with felt, they are extremely flexible.



Top, pads worn over football uniforms cushion shocks of blocking plays. Below, a lighter pad for backfield men



How guard keeps animal from biting off its trapped leg

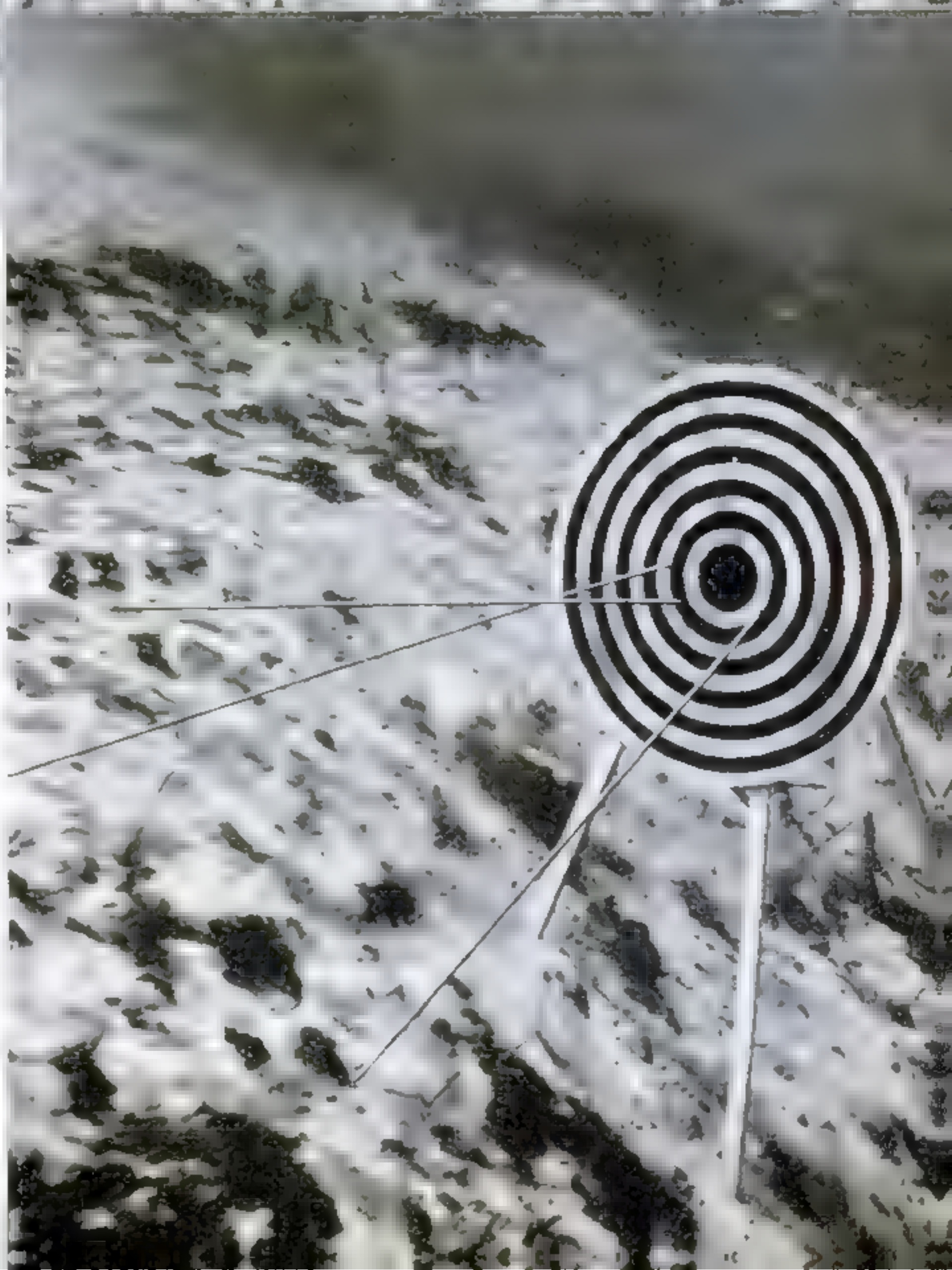
Trap Prevents Animal from Working Free

DESIGNED to prevent small animals from freeing themselves by twisting or gnawing off a leg when caught, a new trap has a secondary "guard" that springs automatically when the animal tries to get away. The guard, hinged at the bottom of the trap, is a U-shaped member that is set when the trap is put down. When sprung, it literally holds the animal's body away from its trapped foot so that it cannot bite its leg, nor twist itself without twisting the trap, too.



Target Range Under Water

UNDERWATER target practice with rubber-band guns is a novel sport recently introduced in Florida. Donning water goggles, contestants dive below the surface with bamboo guns fitted at one end with heavy elastic bands that fire steel-tipped spears about three and a half feet long. After each shot, the contestant bobs up to the surface for a breath of air before returning to the underwater range. Remarkable accuracy is obtained with the curious spear guns, it is said.



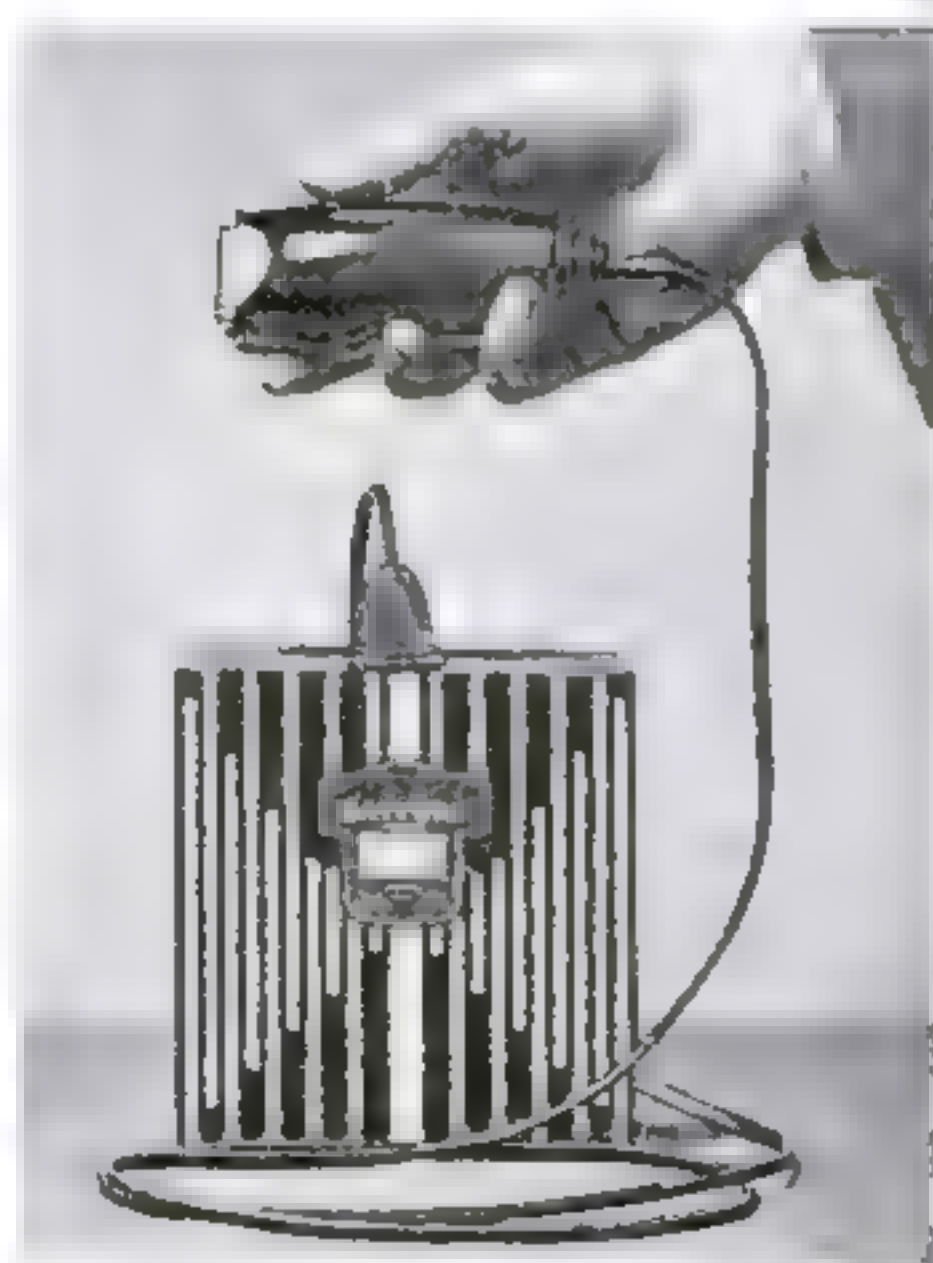
Scale in Soda-Fountain Seat Warns Overweight Patrons

SODA-FOUNTAIN patrons may watch their weight as they enjoy their drinks and sundaes, with the invention of a counter seat that also serves as a scale. Through levers beneath the pedestal of the seat, the customer's weight actuates an indicator built into the counter. By consulting the dial, customers can decide whether to order fattening foods.



Battery Runs Electric Razor

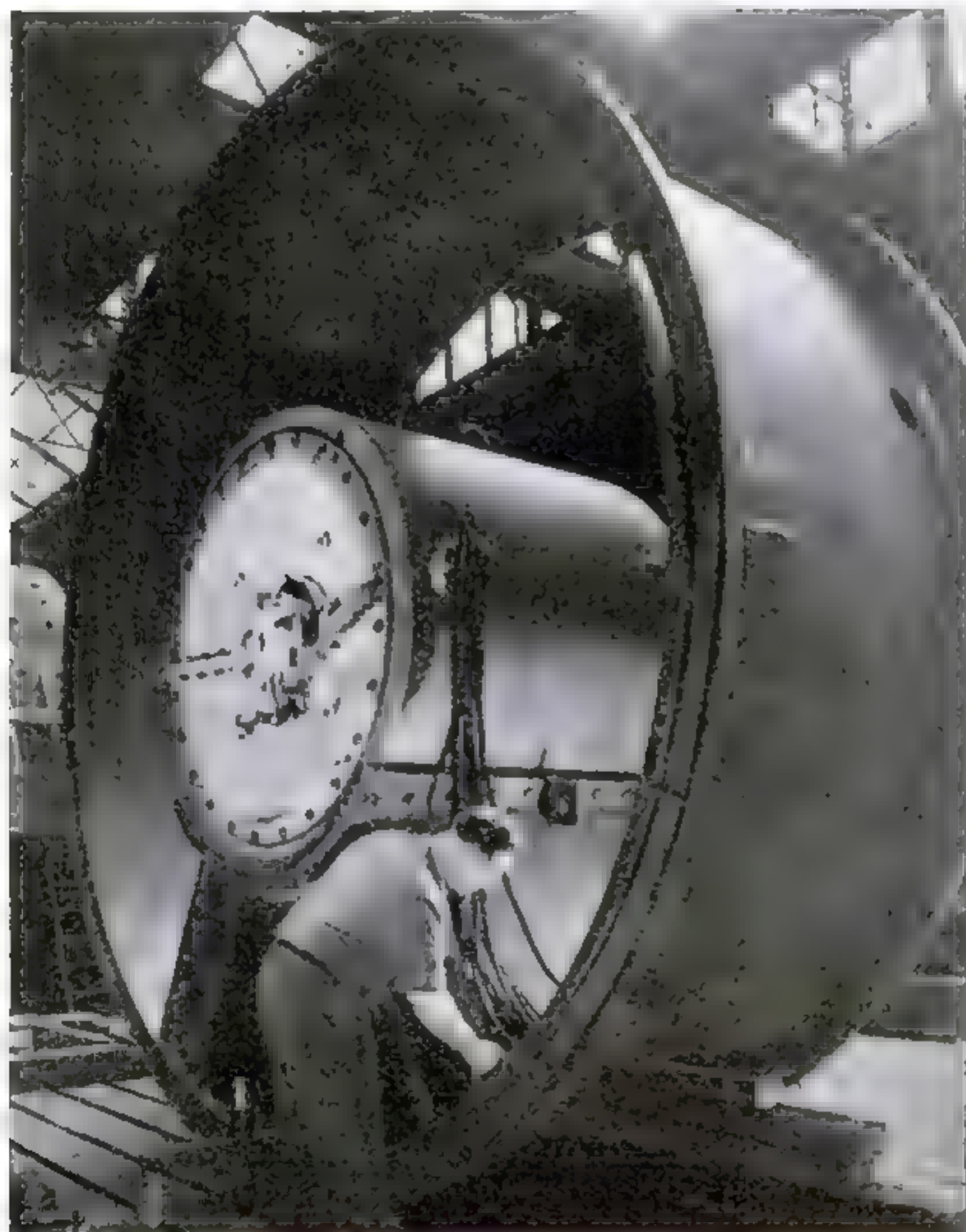
PORTABLE batteries for electric razors, just placed on the market, aid vacationists, salesmen, and other travelers who may visit places not wired for electricity. From a socket that fits the customary two-prong plug, the battery delivers direct current at the standard rating of 110 volts, operating the razor effectively.



"Better not take that fudge sundae," this customer muses when she sees the reading on the dial set in the counter

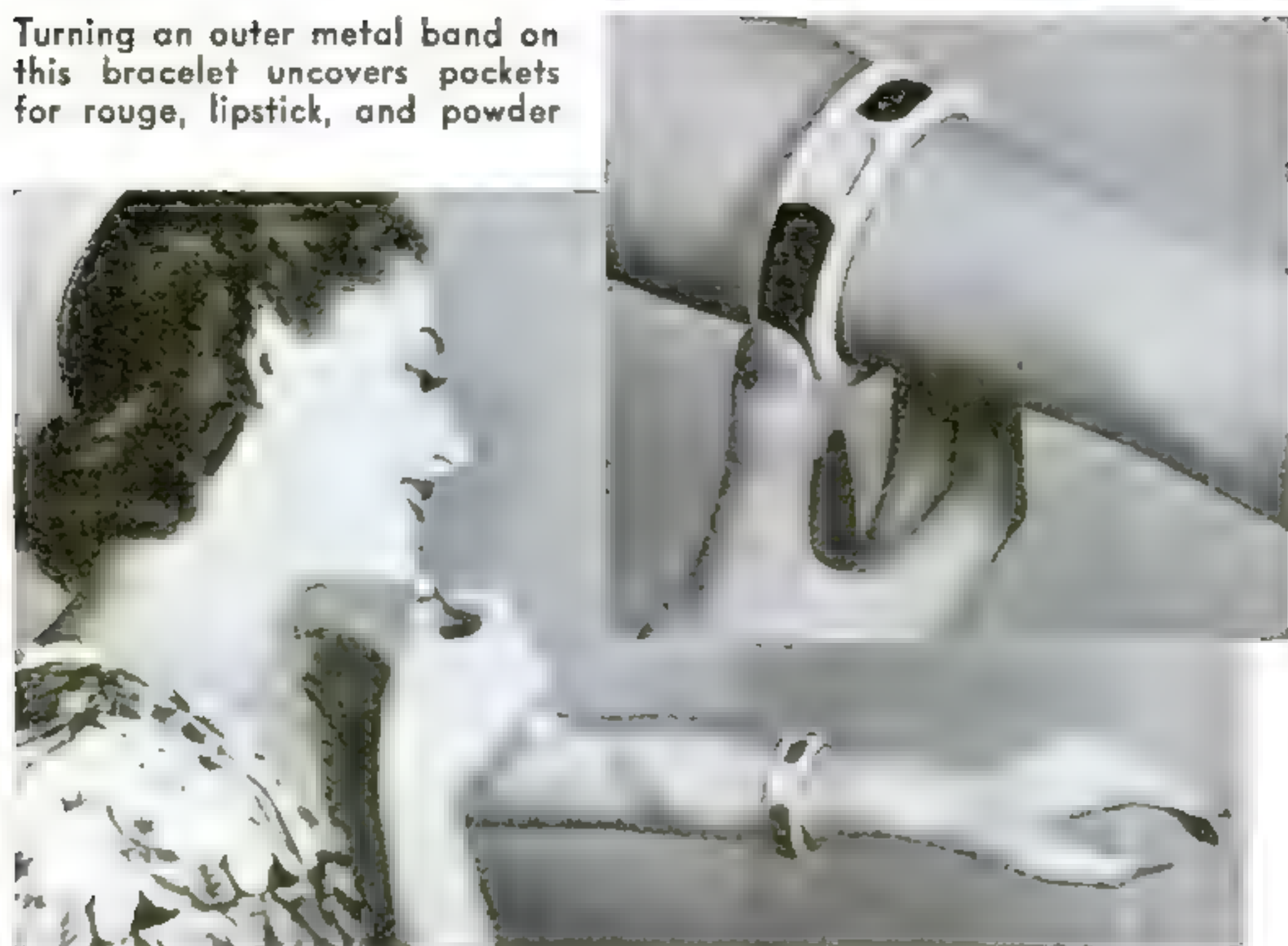
Giant "Typhoon Tunnel" Creates 400-Mile Gale

TWICE the speed of a West Indies hurricane will be packed into 400-mile-an-hour gales by a new wind tunnel at the Massachusetts Institute of Technology. A ten-ton, four-speed electric motor of 2,000 horsepower, called the largest of its type ever built, will spin a thirteen-foot propeller to produce a wider range of conditions than any existing American wind tunnel provides, for testing models of airplanes, fans, windmills, turbines, and pumps. Air pressure in the seventy-five-foot, oval-shaped "typhoon tunnel" may be varied from one fourth to four times the normal pressure of the atmosphere, and models of high-speed stratosphere planes can thus be tried out under reduced pressure corresponding to the conditions that would be encountered at extreme altitudes. Before use, the tunnel will have a "maximum-pressure test." Water instead of air will be used to avert danger if a crack develops in the steel casing, for the pressure behind the tunnel full of air might devastate surrounding buildings like a small-scale tornado.



The 2,000-horsepower motor mounted in a section of the tunnel

Turning an outer metal band on this bracelet uncovers pockets for rouge, lipstick, and powder

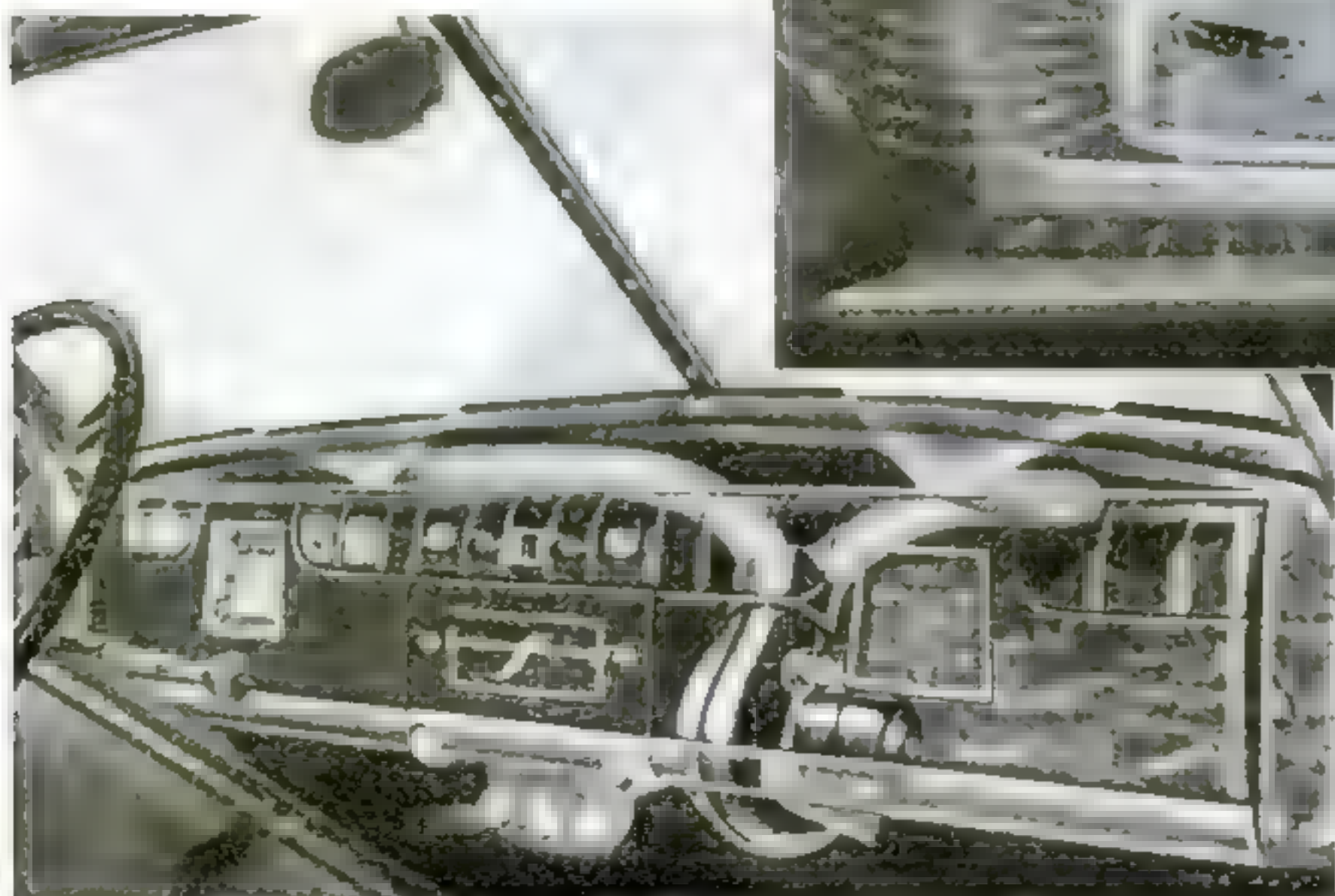
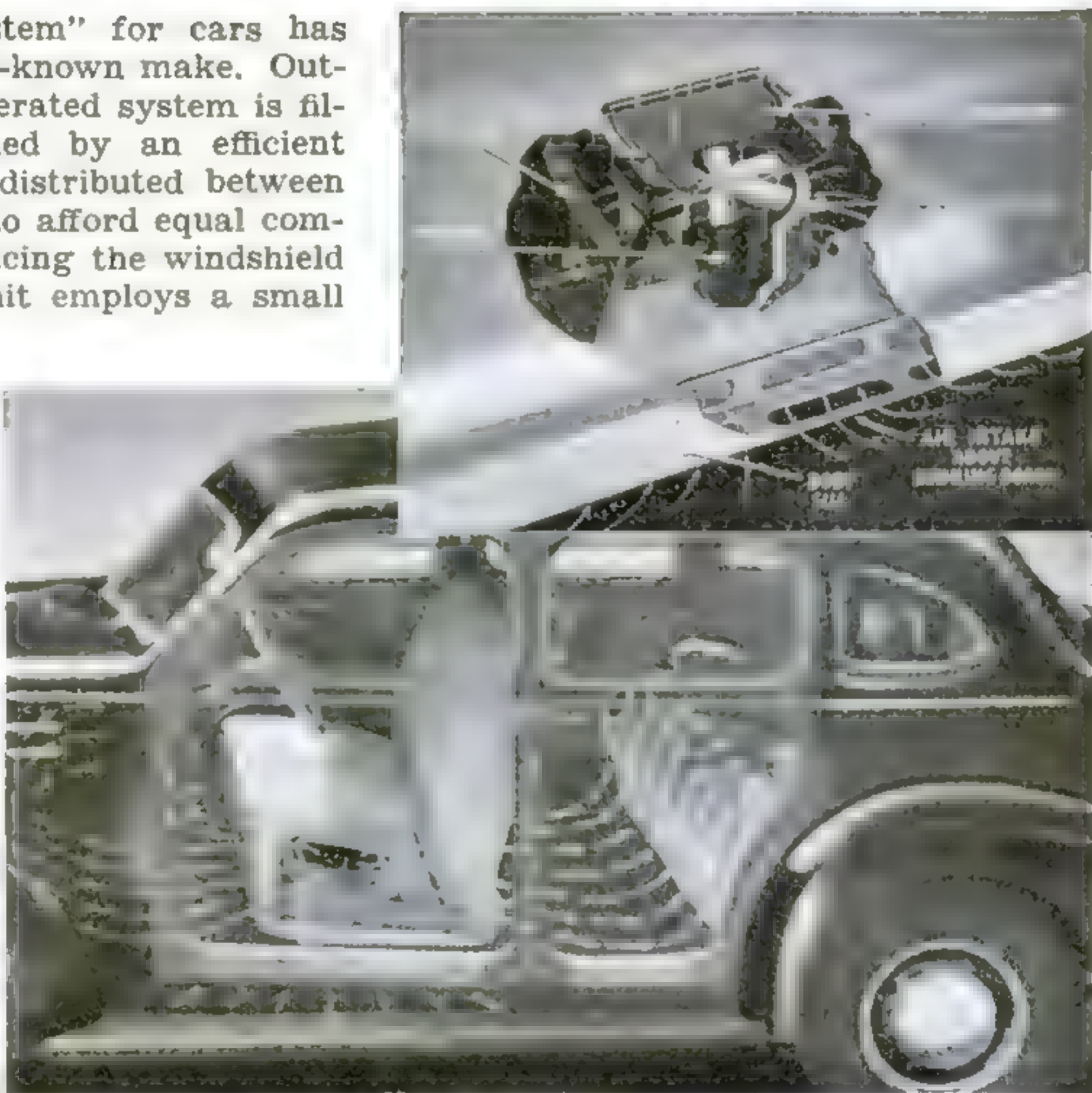


Bracelet Holds Complete Kit for Make-Up

USEFUL as well as decorative, a new "cosmetic bracelet" provides make-up in handy form, especially for social occasions when it would be a nuisance to carry a handbag. Turning an outer metal band on the bracelet uncovers any of seven compartments holding lip rouge, face rouge, and face powder, together with puffs for applying them and mirrors to aid in a quick "touch-up."

Automobiles Get Central Heating System

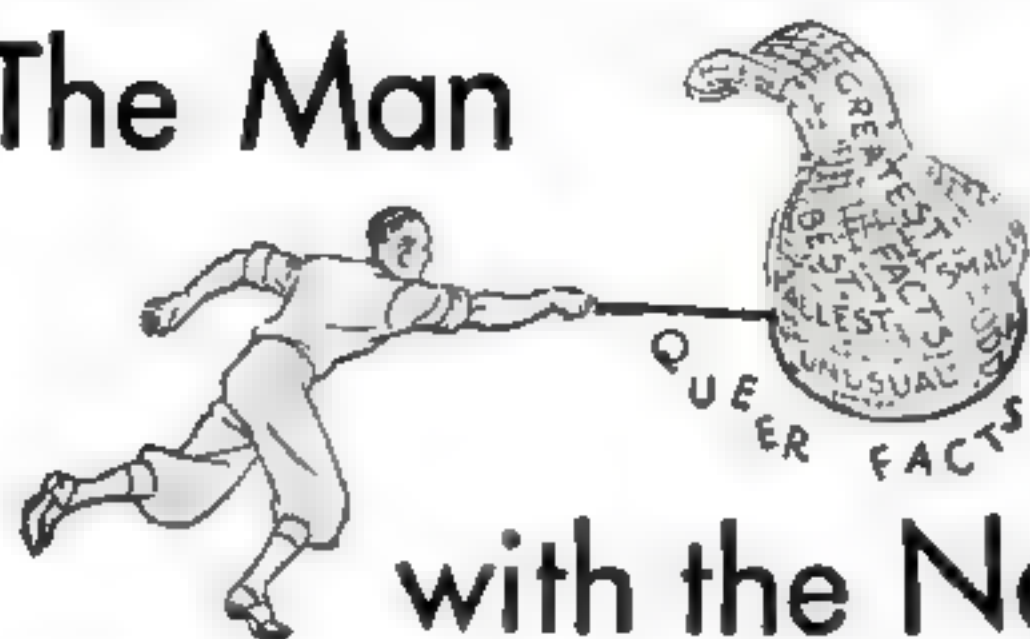
A "CENTRAL heating system" for cars has been introduced in a well-known make. Outside air drawn into the fan-operated system is filtered to remove dust, warmed by an efficient hot-water radiator, and then distributed between front and rear compartments to afford equal comfort to all occupants. For de-icing the windshield in sleet storms, a separate unit employs a small motor and fan concealed behind the instrument panel. Through two outlets in the windshield molding, it discharges warm air from the central heating system to the windshield. In summer, the air-circulating system operates with the radiator turned off, providing cooling ventilation even when the windows are closed.



How air is drawn into the car, warmed by a hot-water radiator, and circulated through front and rear compartments. Inset shows details of the central heating unit itself

Phantom view at left illustrates the auxiliary unit that discharges warm air onto the windshield to prevent formation of ice

The Man



with the Net

BUS DRIVERS in *New York City* shift gears an average of 3,000 times a day.

HENS' EGGS have thinner shells in summer than in winter.

REPEATING mousetraps have been devised by an American inventor.

BEARING the weight of the body, a foot is a size larger than it is when it is lifted from the ground.



RUBBER BANDS, high-speed motion pictures have revealed, snap back to normal length, after being stretched, with a speed as great as 204 miles an hour.

AUTOMOBILE travel at night is three times as dangerous as it is during the day.

ANIMAL charcoal, injected into the veins of patients, is being used to treat pneumonia.

SUBMARINES have been used as mail boats between Loyalist ports in Spain.

MONKEYS in the Malay Peninsula fish for crabs by dangling their tails in the water.



NETTLES, plants with sharp, stinging hairs, are raised in Germany to provide fibers for weaving imitation-cotton work shirts.

TWENTY-SEVEN communities in the United States are named Cleveland; twenty-eight, Troy.

MILK BOTTLES have an average lifetime of thirty-five trips to the consumer.

TOADS in three months will eat as many as 10,000 injurious insects apiece.

YUM-M-M!



Kit Simplifies Etching

KITS for amateurs now enable any school-boy to turn out creditable dry-point etchings. A sheet of transparent plastic is thumb-tacked over a drawing, photo, or magazine picture to be copied. A needle-pointed tool traces the design on the sheet, as shown above. Etching ink is applied, and the surplus wiped off, leaving ink in the traced lines. Then the sheet is run through a clothes wringer, with prepared paper, to make the print.



Electric Mixer Blends Paints

FROM half a pint to a gallon of paint of any special color shade may be mixed with factory precision, using a new "color eye." A dial shows the required proportions, and an illuminated rod extends into the mixing can, which may be an ordinary paint can. When the color reaches the right level, the light automatically goes out to give the signal to stop pouring.

New Aids



N. B. Aukerman and his camera that "streamlines" its pictures. Right, note how model is made taller in the first picture, producing a more graceful figure



Novel Camera Produces "Streamline" Pictures

DESCRIBED as a "contortionate" camera, capable of making a photographic subject appear either longer or wider than it actually is, an unusual picture-taking device, shown above with its inventor, N. B. Aukerman, of Cleveland, Ohio, has just been announced. An example of the camera's remarkable streamlining powers is shown in the side-by-side pictures of the same bathing

model. The left-hand picture, taken with the camera, makes the model nearly a head taller than she appears in the right-hand picture, made with an ordinary camera. The camera also is capable of giving the reverse effect, making the model appear shorter and stouter. The apparatus features a special lens. Except for the desired effect, the camera introduces no optical distortion, it is claimed.

Film Viewer Clamps on Movie Projector

MOUNTED over the lens of your home-movie projector, a simplified film viewer makes use of the projector's lamp and shutter mechanism for showing your amateur films while you edit and assemble them. The device casts a clear image, slightly larger than the film's dimensions, upon a small screen fixed in a frame at a convenient angle for viewing. Its design is such that it can be attached or removed from the projector with ease, and can be operated either by hand or by the regular electric motor of the projector.



Clamped to your projector, the viewer speeds up film editing

for Camera Fans

Movie-Camera Case Opens Easily

SUPPORTED by a neck strap, a new carrying case for a small moving-picture camera opens at a flick of the finger to uncover the camera's lens and the controls for instant use. The handy case holds the camera in place, while its cover falls forward on a hinge out of the way.

New Drying Pads for Film

A NEW film dryer of the clamp type, pictured below, uses removable rolls of lint-free cotton which are inserted quickly in the holder through convenient holes. One pair of the wiper rolls lasts long enough to dry several films, after which it is easily replaced by a new set. Additional supplies of the lint-free wipers can be obtained as needed.



How the lint-free film wipers are replaced in clamps

Improved Films Available for Miniature Cameras

THREE new films, just announced for use in miniature cameras employing thirty-five-millimeter film, are said by their maker to give better pictures than those made on the standard moving-picture film now widely used. The new films are designed for use in either daylight or artificial light, whereas professional-type moving-picture film is primarily designed for use with strong studio lighting. One of the new films is recommended for general amateur use. A second is a panatomic film credited with such fineness of grain that, under extreme enlargements, image sharpness itself disappears before the grain becomes visible. A third, while maintaining the extreme fineness of grain, has added "speed" for instantaneous exposures. Each of the films is credited with wide exposure latitude, freedom from halation, or halo effect, and a balanced sensitivity to light of all colors.



It's an easy job to open this movie-camera case: At 1, the case is grasped in one hand; 2, a flick of finger opens the cover, and 3, camera is ready

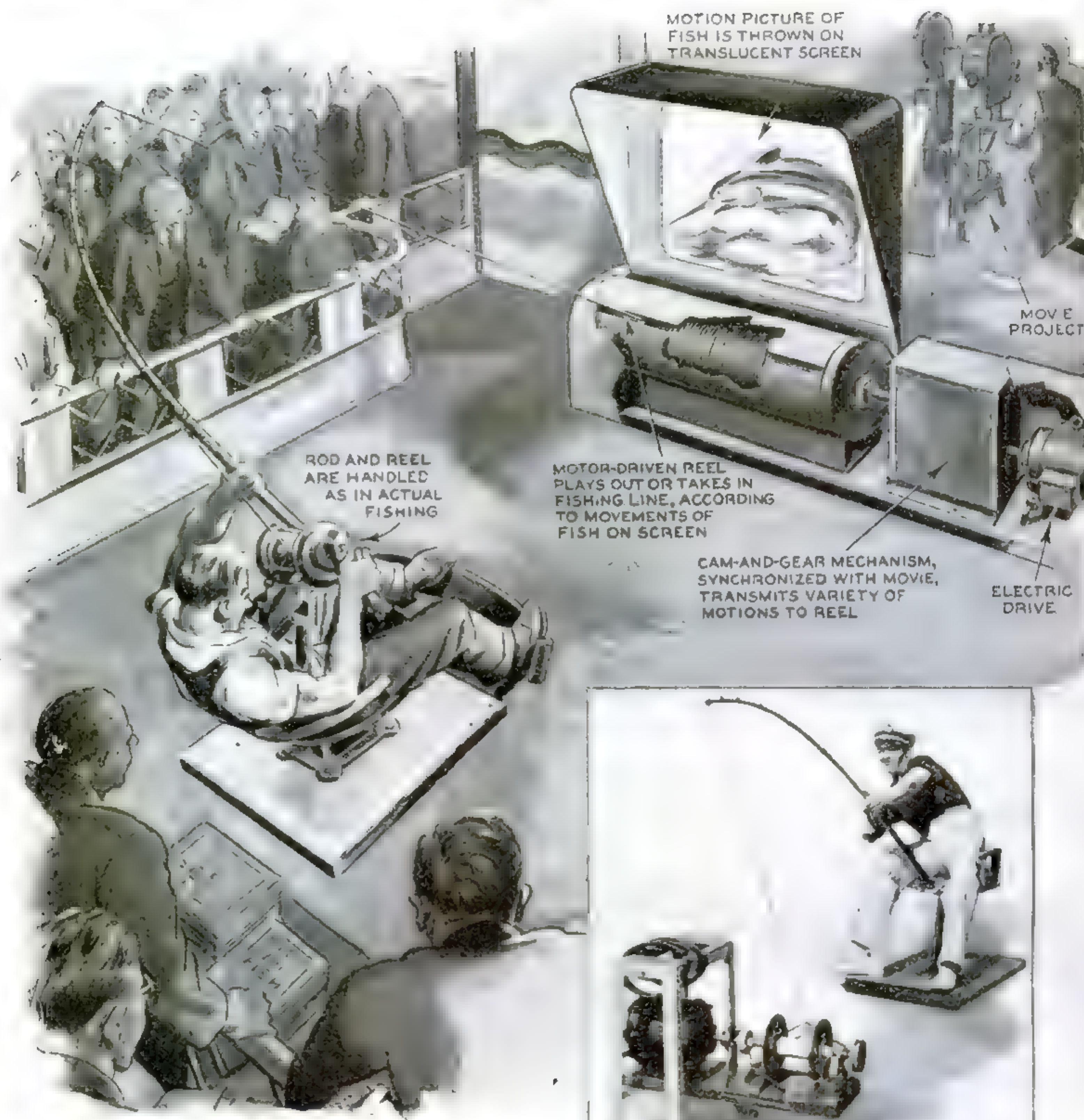
Tiny Exposure Calculator Requires No Setting

STURDY and easy to use, a new midget exposure meter of the extinction type, which operates without a photo-electric cell or a light bulb, requires no setting of special tables or dials for determining your correct shutter speeds and diaphragm openings. Numbers ranged along the top of the instrument under a glass window become visible when the meter is aimed at the light. Increased light striking the meter reveals more of the numbers. The last visible number is compared with the same number on a fixed table at the back of the device for finding the proper settings.



There are no dials to set on this inexpensive exposure meter

Movie Trains Big-Game Anglers



Seated before a movie of a real deep-sea battle, the angler has all the thrills of landing a fish

ALL the thrills of deep-sea fishing, from hooking a giant swordfish to fighting it in toward a boat, are provided for the entertainment of sportsmen on land by an ingenious amusement device. Seated before a translucent motion-picture screen, the angler grasps an actual big-game fishing rod and reel fitted with a line that runs to a revolving drum placed just below the screen. A movie of an actual deep-sea fishing battle flashes on the screen, and the fight is on. As



This simplified and smaller version of the device employs the motor-controlled drum, but no movie

the giant fish darts, leaps, and thrashes about on the screen, a cam-and-gear mechanism operates the motor-driven drum to reproduce the exact tugs that the angler would feel on his line if the film fish were real. Matching his wits against the mechanical fish, the angler strives to play the fighting giant toward his "boat," as though landing a real deep-sea fighter on the open water.



Insects brushed from cattle passing through the sheds are electrocuted

Electric Sheds Free Cattle of Insect Pests

FLIES and other cattle pests are exterminated by novel electrocution chambers invented by Edward Newcomer, Pennsuco, Fla., farmer. Cows walk through frame sheds where dangling leather strings brush insects from their backs. Light bulbs then lure the insects into an electrically charged metal box above each shed, where the pests are destroyed. Cows are led through the sheds twice a day.

Tiny Razor for Women

DESIGNED especially for women, a midget safety razor now on the market is only about two inches long, and about an inch wide at the cutting head. The small size of its surgical-steel blade allows it to curve both lengthwise and crosswise in use. Each razor is packed in a decorative case made of a colorful plastic material. The diminutive size of the razor is seen in the photograph.



A double-curved blade makes the razor easier to use

Dummy Locomotive Fools Enemy Bombers

INDISTINGUISHABLE by enemy flyers from a real locomotive, a full-scale dummy engine made out of wood was recently employed by Chinese forces to draw the fire of Japanese bombing planes away from vital pieces of rolling stock near the city of Kiukiang. When Japanese finally took possession of the Kiu-kiang railway station, they discovered their mistake. The decoy engine, as pictured at the right, had been completed in just enough detail to look realistic from the air.

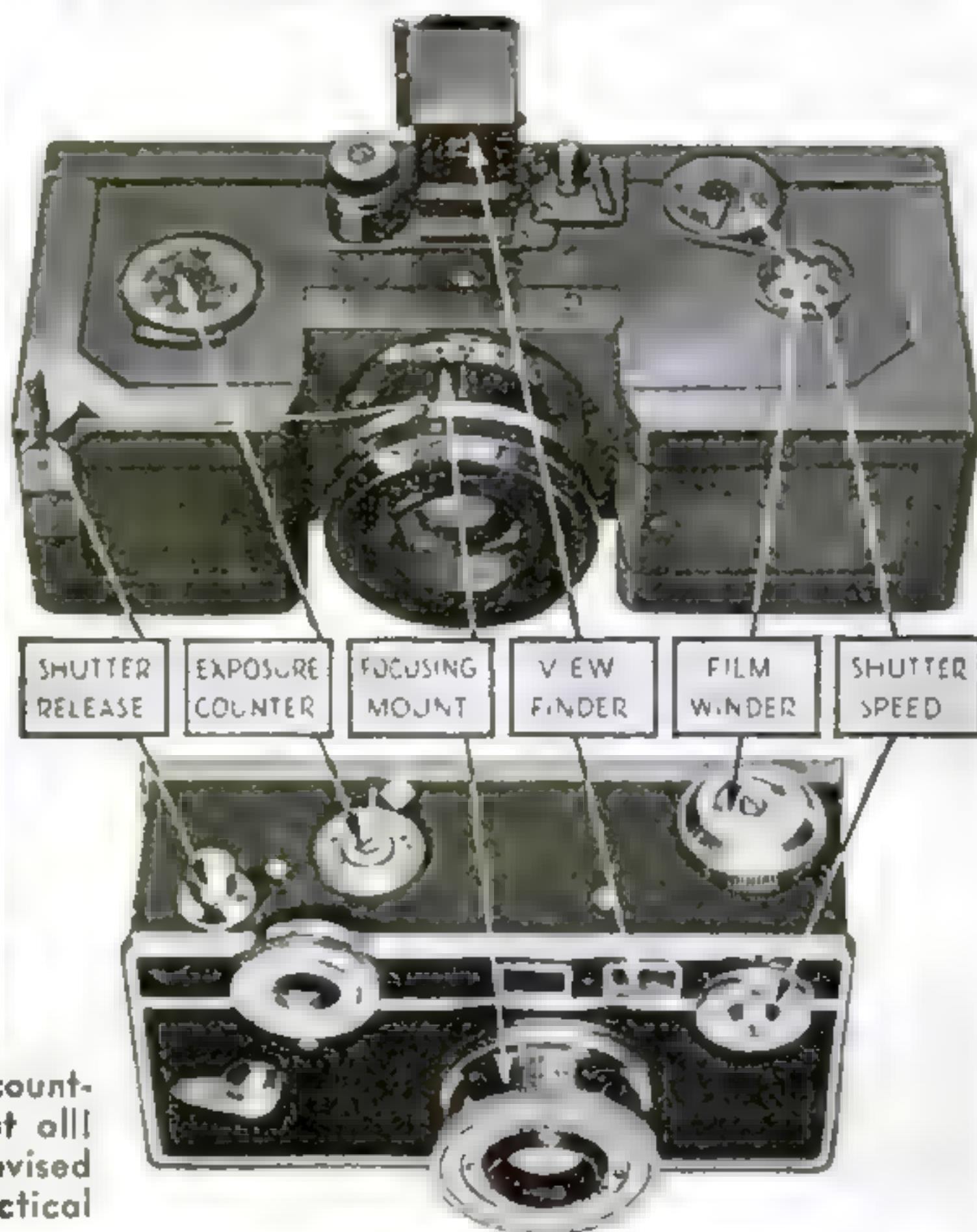


This Chinese copy of an engine tricked enemy pilots into wasting ammunition



Shown in use above is the prototype of today's countless miniature cameras. Made in Europe? Not at all! An American citizen of Richmond Heights, Mo., devised it in 1912, and then stored it away as impractical

Who Invented the Miniature Camera?



WHO invented the miniature camera—the instrument that has revolutionized picture-making by making “still” photos on inexpensive movie film? Fans who shared the popular belief that the idea came from Europe received a surprise at a recent photographic exhibition in New York City. They saw what apparently deserves to be called the pioneer of all miniature cameras. Affidavits from eyewitnesses certified that Guy P. Smith, of Richmond Heights, Mo., built it away back in 1912—years before foreign designers brought out their first models.

At the time, Smith's business was making lantern slides for the “magic lanterns” of that era. It occurred to him to take advantage of the lower cost of the small-size moving-picture film then available to enable him to turn out his slides more economically. After all, such film was designed for projecting images on a screen, and therefore would be well suited to the making of his transparencies.

His camera was the result. He never troubled to patent it. Contact prints from tiny negatives

did not seem desirable, and movie film of the day was so grainy anyway that enlargements suffered from loss of clearness and definition. So the completed prototype of the modern miniature gathered dust, unheard-of, in his shop, while camera manufacturers in Europe wrestled with the same idea. By the time they finally perfected their camera, grainless movie film was available for it, and the “miniature” became a success.

Place Smith's camera and a modern one side by side, and examination shows them to be very much alike in many details. Both take a picture of 24 by 36-millimeter size on standard 35-millimeter motion-picture film. Exposure-counter dials are virtually identical. Each camera employs a lens of two-inch focal length, in a focusing mount, with a trigger-release shutter. Both models use daylight-loading film cartridges. In the light of this new evidence, American camera fans can take pride in the fact that one of their own countrymen was probably the first to build and use the now popular “minnie.”



Guy P. Smith, maker of the original miniature camera



Nurse using the ultra-violet lamp to stencil initials on a baby's skin

New Sun Lamp Held in Hand Brands Babies

A NEW hand-type ultra-violet-ray lamp makes it easier for nurses in a Brooklyn, N.Y., hospital to brand the initials of a new-born baby on his skin to prevent identification mix-ups in the hospital nursery. Soft ultra-violet rays pass through stenciled initials placed within the easily handled unit to tan the letters on the infant as well as on the mother. Harmless, the identification brand is said to remain visible for a period of two weeks.

Odd Safety Plane Lands at a Standstill

TAKING OFF and landing at almost incredibly slow speeds, a high-wing "foolproof" monoplane flown by Emil Kropf, German exhibition flyer, recently demonstrated its safety features during a test flight at the Bendix, N.J., airport. Claiming that his plane could navigate in the air even with a stalled motor,

Kropf took off after a run of only sixty feet, came practically to a dead stop in mid-air, and then settled in an almost vertical direction to a safe landing. Short take-offs and easy landings, as demonstrated by the plane, he declared, point the way to new aviation safety and ease of operation.



Dropping almost vertically to the ground, the high-wing monoplane requires little space for a landing

Silent Noisemakers



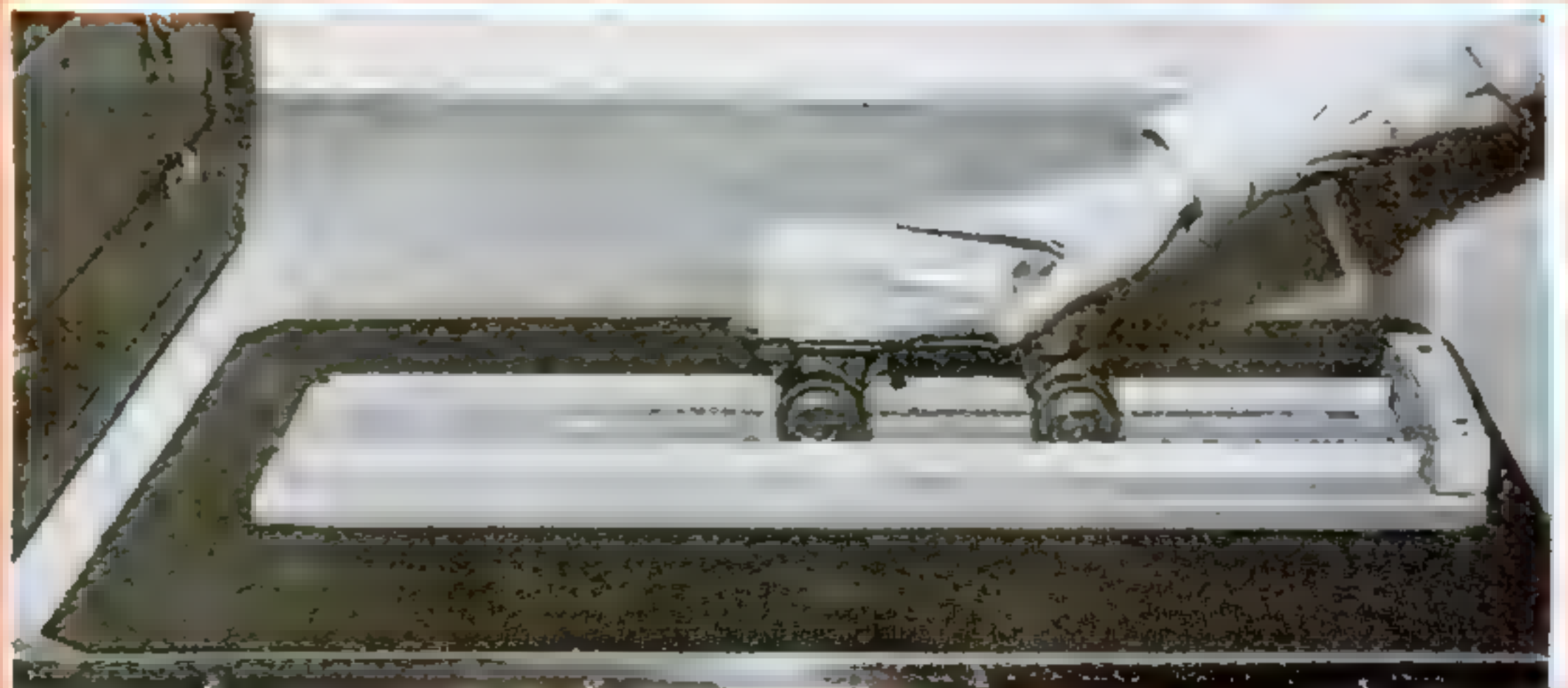
In the studio, you could hardly hear this copper window screen being tapped with a soft drumstick. But an electrical pick-up brings to your loudspeaker the boom of giant cannon

By
**GROVER C.
MUELLER**

IN A radio broadcasting studio, a sound-effects man taps an ordinary copper window screen with a soft-headed drumstick, and listeners-in thrill to the boom of big guns on an imaginary battlefield. Another technician presses against the microphone an inflated rubber balloon containing ten large buckshot, and the loudspeakers shudder with the reverberations of a mine explosion. Although these tremendous noises reach the receiving sets with startling realism, in the studio itself scarcely a sound is heard.

"Silent sound"—sound which in some cases does not exist until converted from physical vibrations into electrical impulses—is the latest achievement of Columbia Broadcasting System technicians. To the window screen, for example, is attached an eight-inch spiral wire which acts like a phonograph needle in conveying the vibrations to an electrical pick-up head. An electric cable transmits the resulting smash of artillery fire to the microphone. The rolling shot in the balloon likewise create

Opening and closing of an elevator door are realistically imitated by the device at the right, in which a roller skate is rolled along a narrow metal track to strike a pair of nails or a wooden bumper



Latest in Radio

This is a radio rattlesnake. If you hear the ominous warning of a diamond-back in a radio drama, it probably comes from a snake rattle shaken by this device



With the portable telephone below, technicians can reproduce the sounds of a phone bell ringing, a "busy" signal, dialing tones, and hanging-up click



no appreciable noise, yet when the device is held directly against the microphone, audiences thousands of miles away hear explosions, landslides, steam turbines, and locomotives. The effect depends upon the diameter of the rubber container and the size of shot used. When an actor talks against the balloon into the microphone, listeners hear shouts as they would echo through an empty cathedral or cavern.

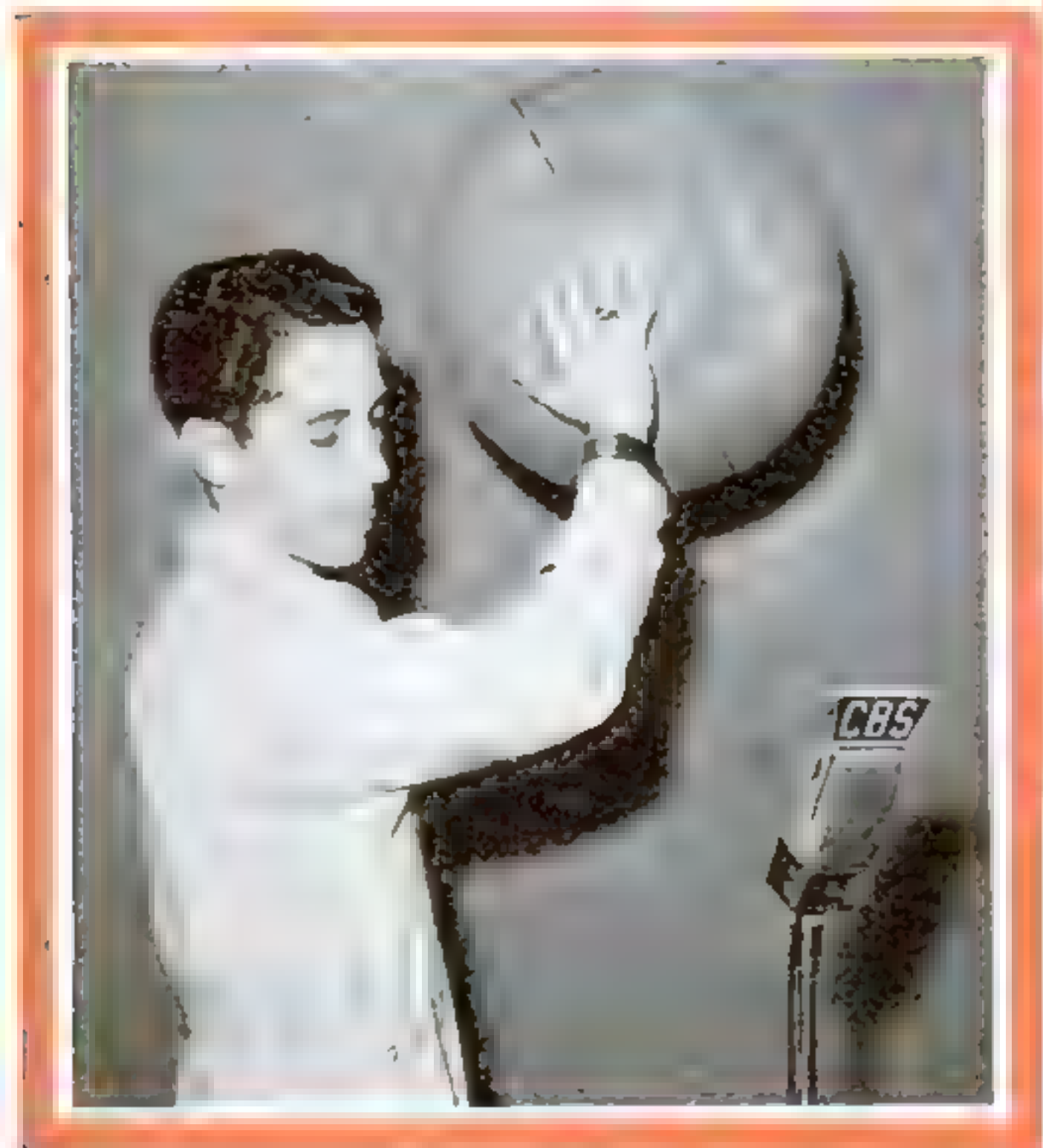
These and other devices bring greater realism to your loudspeaker. Not always may the sound men resort to such trickery, however. When you hear the dread rattle of a Texas diamond-back about to strike the villain in a radio melodrama, real snake rattles vibrated by a shaft attached off-center to a motor are singing their song of danger into the "mike."

Sometimes combinations of effects must be used. If the script calls for a man to leave jail, enter a taxi, and take an elevator in his apartment building, first a barred door slams closed. Then you hear an old automobile door closed in the same frame. A roller skate

Wagon wheels—the rumble of any vehicle from a huge stagecoach to a light buggy—can be imitated by varying the rollers under the iron-tired wheel of the odd device at the right



A mine explosion in the making. Ten large buckshot, shaken inside an inflated rubber balloon, sound to the microphone like the dull reverberations of a subterranean blast



When a script calls for hollow shouts in a cavern, an actor talks against the surface of the balloon while holding it up near the microphone as shown



By shaking the shot-loaded balloon rhythmically in front of the "mike," the wheezy starting of a steam locomotive is imitated for railroad dramatic scenes

slides twelve inches along metal tracks and strikes a wooden bumper to represent the closing of the elevator door. Seconds elapse, and the skate is moved in the opposite direction, now striking two nails. The door is opened.

Hurriedly, the actor calls his lawyer. An ingenious telephone invented by Alfred Span, sound-effects specialist, swings into action. The audience may hear either the distant ringing or the "busy" signal, and the click of the receiver holder and the tone of the dial are faithfully reproduced. There is no danger of the bell ringing accidentally while the actor talks into the transmitter, for the bell is disconnected automatical-



In shooting-gallery episodes, the sound-effects man whacks a board with a stick for the gun explosion and rings an electric gong for the ping of bullet on steel

ly when the receiver is lifted from the hook.

Not long ago, Span was seeking a way to "stretch out" the break of a window pane when he hit upon a simple trick. Now he fits the glass horizontally into a frame, and when he smacks it with a hammer, the pieces drop against a series of baffles to make a prolonged tinkle.

Sound effects that fail may bring forth artificial substitutes. Not long ago, a blank cartridge missed fire during a shooting-gallery episode, yet the mythical bullet clanged into a target. Now, when such a scene is played, a sound man strikes the fiber-board head of an old packing box for the explosion, and rings a gong electrically to represent the impact.



Another curious noise-making machine may be a buggy today, a covered wagon tomorrow. An iron-rimmed wagon wheel turns against a pair of rollers which are changed to provide the noise wanted. It rests among the other devices that give realism to modern radio dramas.

Automobile door and jail-cell door are combined in the movable sound prop at the left. Sometimes both are slammed in one play



Workmen setting up forms for casting a bombproof concrete shelter. A vacuum process speeds the drying



Bomb Shelter Built Quickly

EMPLYING a vacuum-hardening process for concrete of his own invention, Karl Billner, New York City concrete expert, recently showed naval, military, and diplomatic officials in Washington, D. C., how a concrete bomb shelter, strong enough to withstand light artillery fire and aerial bombardment, could be erected in the almost incredibly short time of four hours. The shelter, which could also be used as a "pill box," or machine-gun nest, measures twenty feet in length, twelve feet in width, and nine feet in height, measuring from its base to the top of its arched roof. Walls of the concrete structure are twelve inches thick. To construct the bombproof shelter, special airtight outer and inner forms were first set up, concrete was poured, and then Billner's vacuum apparatus (*P.S.M.*, May '37, p. 42) was applied to the forms to draw out the excess water in the mix and thus promote rapid drying and setting without weakening the strength of the finished walls. The vacuum machinery was used for a period of about



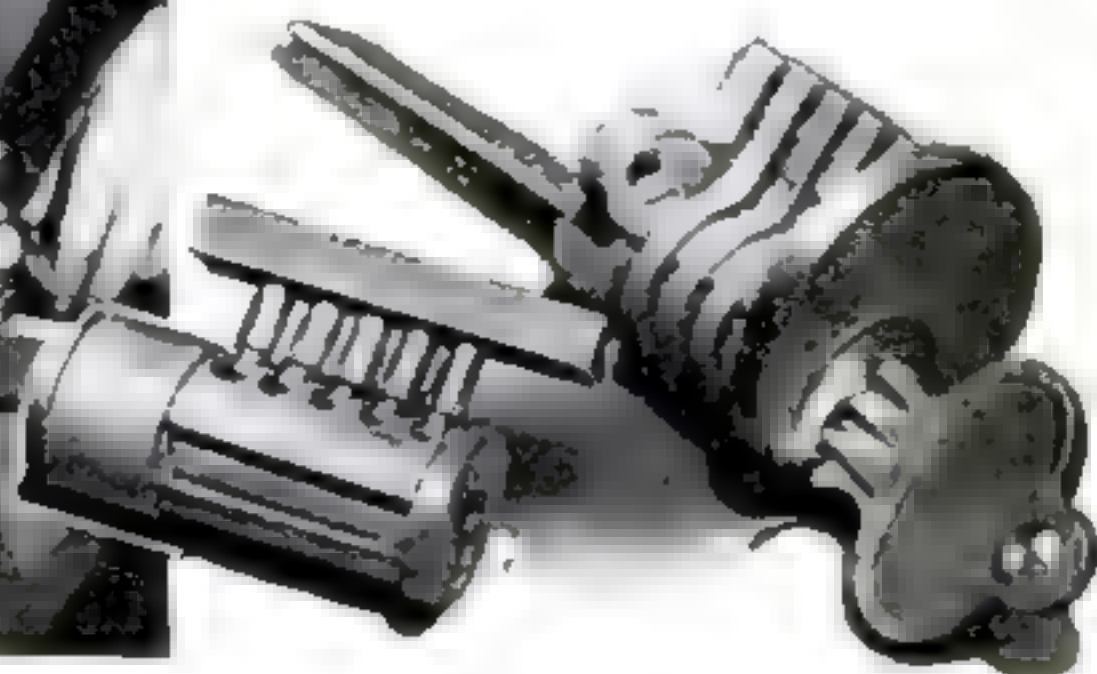
Four hours after start of work, the shelter is ready for use. It may also be used as a "pill-box" fort, or machine-gun nest

one hour, after which the outer form was removed. Then the inner framework, which was mounted on wheels, was hauled out from within the shell on a steel track laid along the ground. The ends of the shelter were then finished off, provision being made for a small entrance, peep holes, and gun slots. By this method, it is declared, concrete bombproof shelters or machine-gun nests could be built under the cover of night and be ready for use before dawn, in the event of a sudden attack making them necessary to protect civilians or aid defensive operations.



Tampering Jams Pickproof Lock

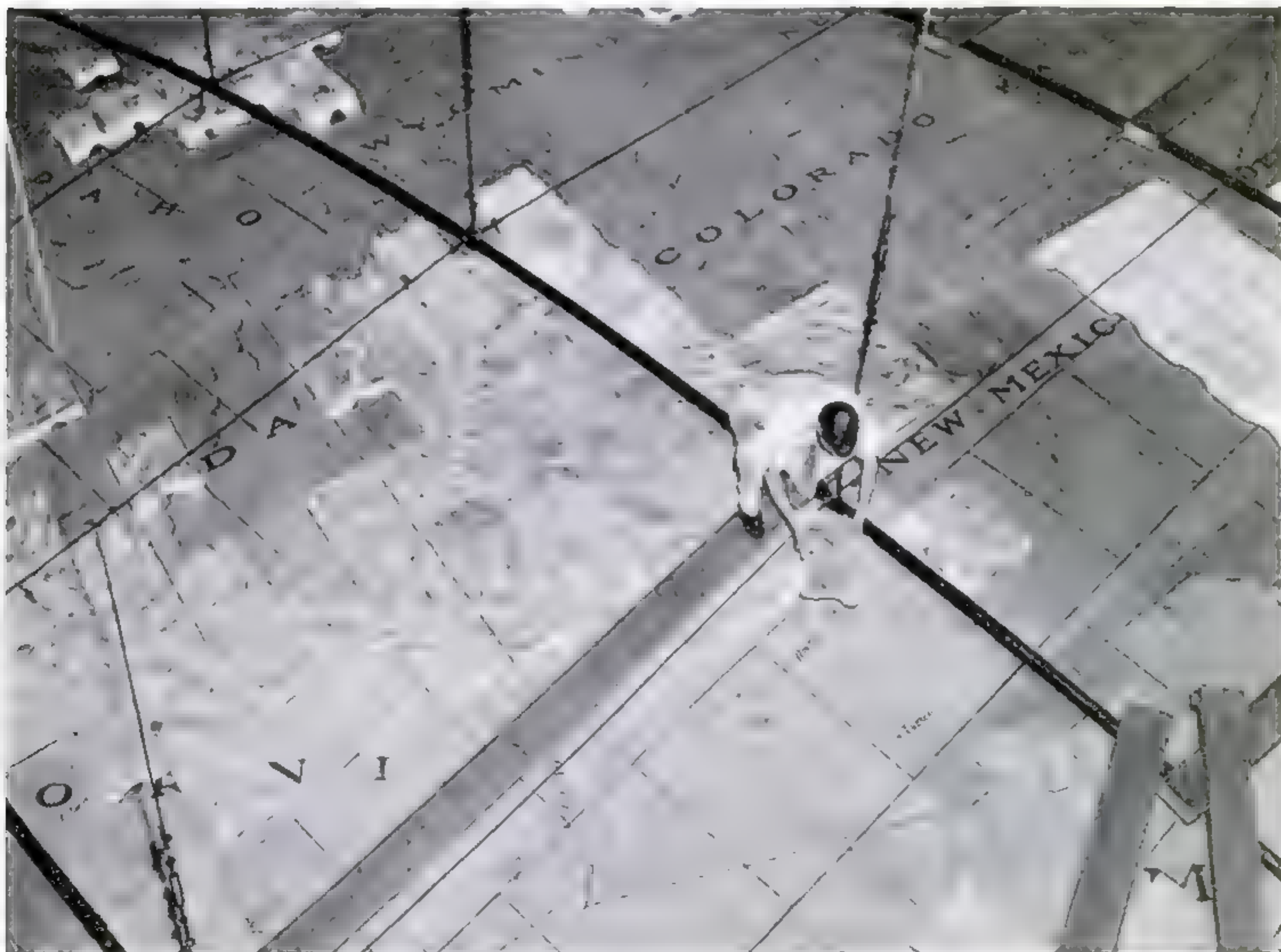
COMpletely pickproof, a new cylinder-type lock just perfected cannot be opened in any way except with the owner's key, according to its inventor, Samuel Segal, a former detective of the New York City police force. The lock contains an oscillating protective sleeve fitted over the cylinder plug and movable pins that jam the mechanism whenever any attempt is made to open the lock by picking or with any device other than the key designed for it. The photograph at the left shows Bernard Zion, famous locksmith, during the course of his unsuccessful attempt to pick open the lock, as its inventor looks on. Inset shows the interior mechanism of the lock.



Giant Relief Map of U. S. Shows Curve of Earth

THE largest curved relief map of the United States ever to be constructed is now being put together by a corps of geographical experts at the Babson Institute, Wellesley, Mass. Mounted on a dome-shaped steel frame-

work measuring sixty-three by forty-five feet, which reproduces in exact scale the curvature of the earth, the map is scheduled for completion in 1940. The section pictured includes parts of California, Arizona, and New Mexico.



Accurately scaled, this curved map of the United States will be the largest in the world when finished

Hobbies



Cliff Arquette, Hollywood's "man of a thousand hobbies," with two of his marionette creations. By profession, he is a radio comedian



HIS friends laughed when Cliff Arquette announced that he planned to create puppets which not only would emulate Charlie McCarthy by moving their mouths and eyes, but also would raise their hair when frightened. As he worked, Arquette solved the mechanical problems one by one, and recently a show of his creation appeared in an all-puppet motion-picture sequence which is considered tops for mechanical actors.

Arquette is not a professional puppeteer. He plays more than fifty parts on various N.B.C. programs, from Jack Benny's father to the lawyer who harasses George Burns. He is the whole supporting cast on several air shows, and often plays a half dozen parts in a half hour. When not acting, he develops a variety of home interests, working quietly in his garage on bits of tin and lengths of pipe rescued from junk yards. He is known in Hollywood as "the man with a thousand hobbies."

Walk through his home and you may see marionettes in various stages of building, a novel recording outfit and rubber-cushioned microphone, spotlights made from large popcorn cans, an odd projection screen, a lightweight truck for still and movie cameras, and a set-up for filming movie cartoons in color. Arquette made all of them.

As all hobbyists know, one development leads to another. Take

At left, Arquette is using his homemade camera-tripod truck to make a close-up picture. Below, how the truck folds up



Are His Hobby

the marionettes, for instance. Arquette became interested in puppets five years ago. They must be different, he knew, if his little figures were to receive recognition. So he devised a plan for cutting the bodies six at a time, modeled the heads, and reproduced them in a plastic material. Then he installed movable mouths and eyes, for good measure setting the hair in a skull cap hinged through the head to a spring which could be controlled to make the hair literally stand on end.

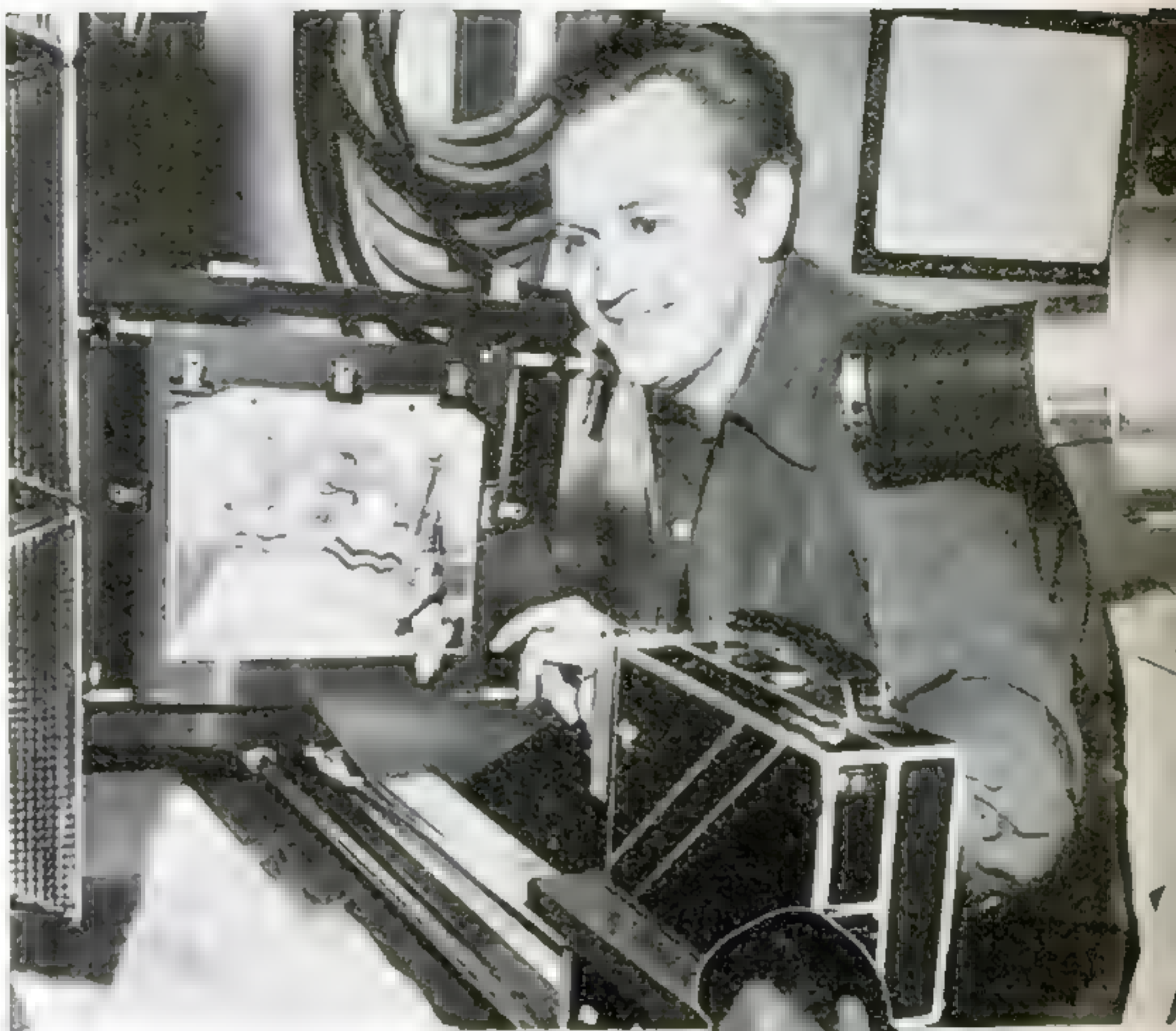
"To make sure these little fellows operate properly," Arquette tells you, "we design them on paper, and follow the drawings in detail." "We" includes Bob and Bill Jones, two friends. So popular have the marionettes become that Arquette turns them out for his friends.

Primarily a showman, Arquette went on from animated puppets to animation on celluloid. Two years ago he was seeking some way to record the growth of his baby from Christmas to Christmas. But by what novel approach? He hit upon the idea of producing a fantasy in colored pictures.

First he trained a sixteen-millimeter camera on a ball mirror, which both reduced and distorted the baby's figure. Using this film record as a guide, Arquette made scores of drawings on celluloid, exactly as the professional cartoon makers work. He placed his camera on top of a drill-press stand, adjusted two lights on the sides to avoid reflections from the celluloid sheets, and began shooting.

Every year he adds to his original script, using the cartoon idea to record the baby's reaction to his Christmas toys. He exposes two frames on each bit of action. By lowering the camera eighteen inches in quarter-inch steps and changing focus three times, he moves in for close-ups, thus making one set of painted "cells" do double duty. At that, he paints 1,500 separate cells for 100 feet of action, shooting at times through six cells of foreground action into background scenery.

This fantasy led to another interesting hobby de-



Making movie cartoons in color is one of his many avocations. Here he is changing the transparent celluloid sheets on which the drawings appear. The room-corner bar seen below was made from a barrel

By
JOHN E. LODGE



velopment. Arquette writes radio scripts. Continuity of the cartoon led him to think he could evaluate his work better if he created an entire program in sound before submitting it to a sponsor. Accordingly, he built a complete recording outfit, assembling a six-stage amplifier, two turntables, recording head, two pickups, a radio receiver, microphone, and boom.

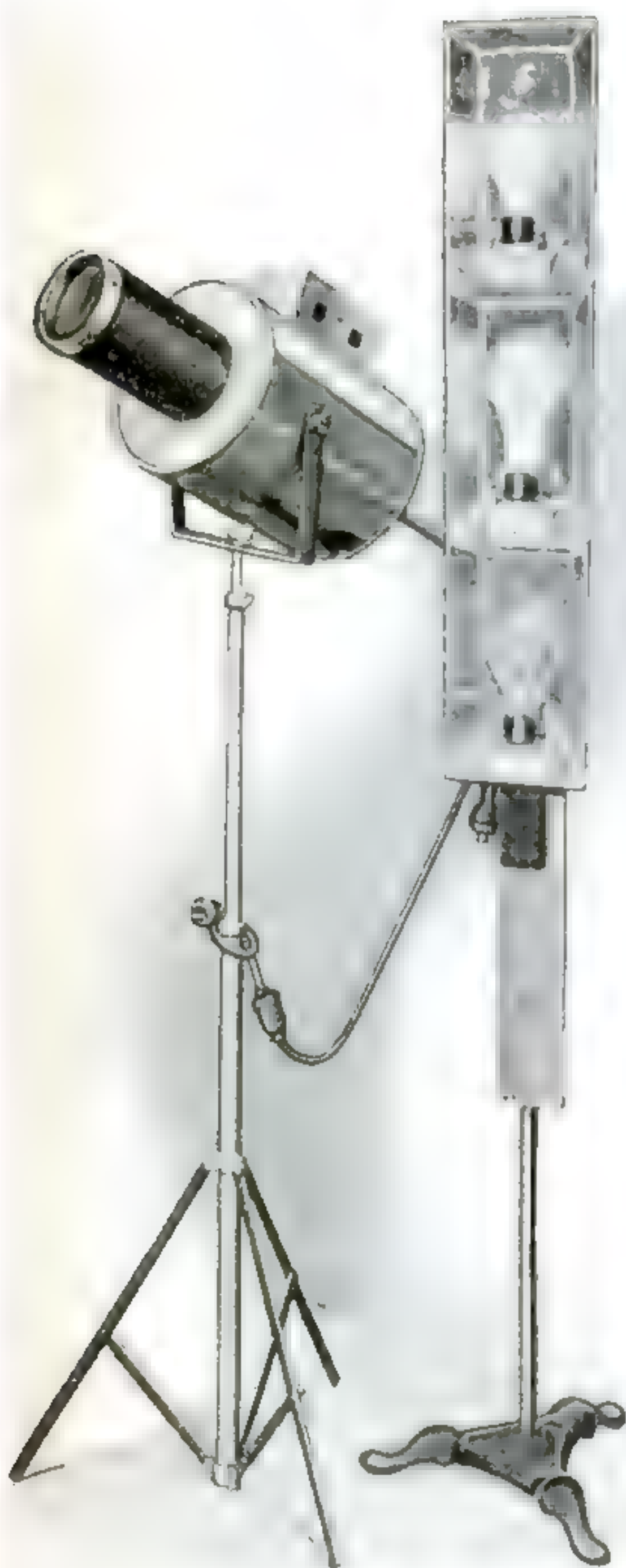
Standing before the microphone for one half-hour show, he recorded a theme song, swung into an announcement, and alternately played the parts of a vocalist, a comedy team, an old lady giving household hints, a guest star (Lionel Barrymore) and a guest conductor (Ben Bernie). At proper spots, he dubbed in music and applause to make the thing even more realistic.

To achieve the best possible reproduction, the playwright-producer-announcer-actor-inventor mounted the dynamic mike in a sponge-rubber-lined tin can. "This arrangement," he explains, "increases sensitivity and kills live hum and shock."

ARQUETTE pursues his hobbies with an eye to the future. Recently, while pondering the problems of television, he asked himself: "Where will I fit into talking-pictures-on-the-air?"

He recognized two hurdles which must be overcome—quick changes of costume and make-up for the actors, and equally rapid changes of scenery. To step from one costume into another is simple, but to go from youth to old age in seconds presented a more

A whole thirty-minute radio program can be "canned" on this re-recorder apparatus. The microphone is housed in a can filled with sponge rubber



The spotlight above was made from a pop-corn can. The reflectors of the floodlight are breadpans



Arquette became interested in making his own animated cartoons as a means of recording his child's reactions to its Christmas toys. As he followed up this new hobby, he worked out several characteristically ingenious processes and devices to help him with the work



With his camera mounted on a drill-press stand, Arquette can make cartoon close-ups without extra drawings. Left, coloring the pictures. It takes 1,500 for 100 feet of film

complex problem. He submitted the make-up question to the drawing board, and from his garage came plans for a close-fitting rubber mask, which snaps over the face.

Arquette first models a mask in clay, casts it in moulage, brushes on hot latex in thin layers, and finally tints the cheeks and forehead. He carves in the wrinkles and tints the surface for age effects. Already he has worn such a mask in stage appearances, made up as an elderly female comic. Actors, fitted in advance, can change faces in a few seconds, while the television show fades out and in, according to a novel idea for quick scenery changes that he has worked out.

He bought an oblong piece of glass, thirty-six by forty-two inches, and applied eight coats of liquid transparent cellulose. With the ninth coat, he mixed whiting, which provided a dull surface. When the last coat had dried, he stripped the hardened cellulose film from the glass, punched eyelets through the edges, and mounted it in a wooden frame so that it would serve as a motion-picture screen. Around the center he added four coats of cellulose to diffuse the "hot spot"

that would be thrown from the projector.

With this ingenious homemade screen, he proceeded to make "process projection" close-ups, filming the head and shoulders of his wife against a motion picture projected onto the screen from the rear. As hobby No. 1001, Arquette now plans to build a much larger screen, piece together on a thirty-five millimeter film various natural scenes in proper sequence, prepare masks for several changes by a small troupe of actors, and have them ready for a complete show when television tryouts hit Hollywood.

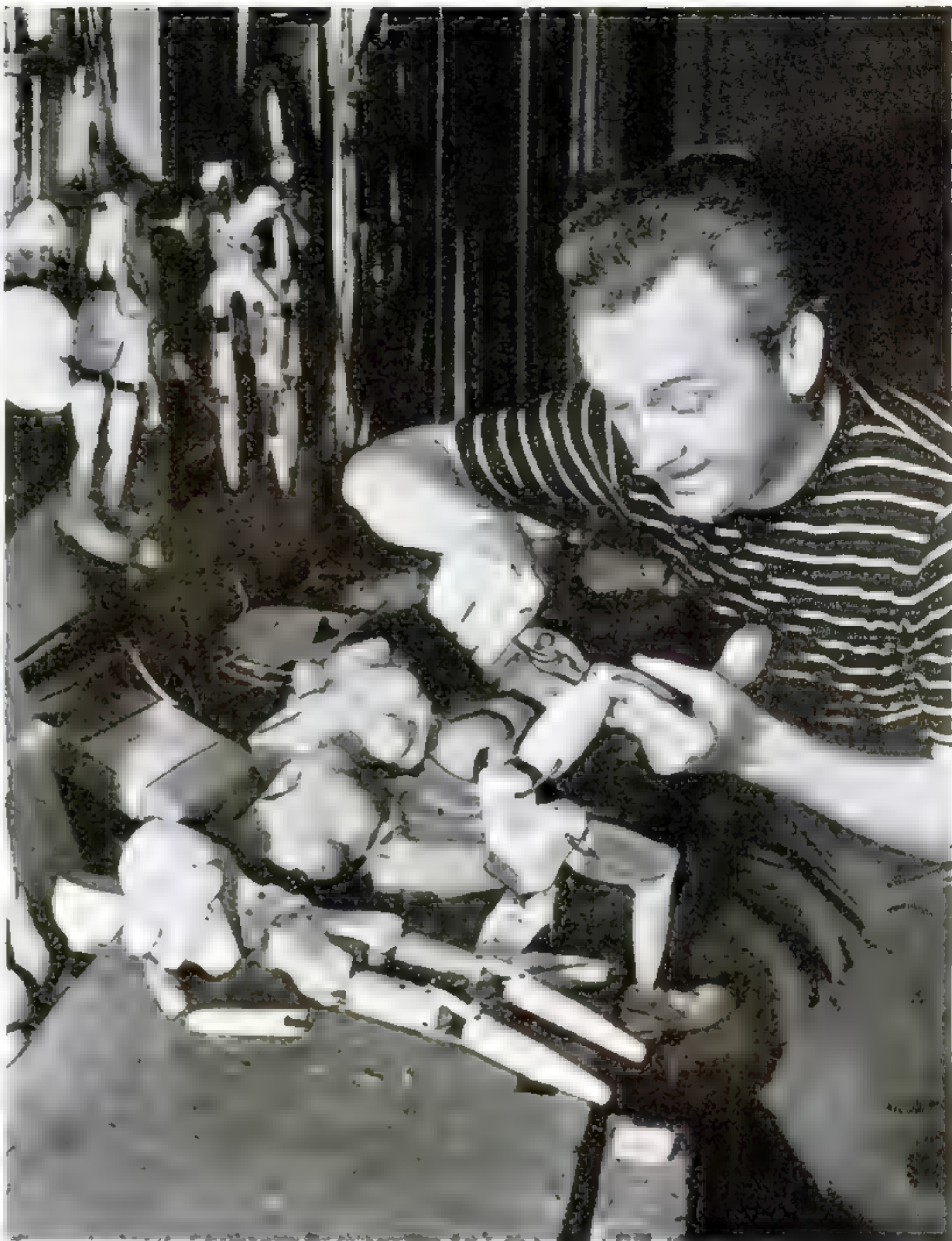
ALL his devices are useful, yet few cost more than a couple of dollars. Two lights used in making photographs, both movie and still, stand on bases which a decade ago were steering wheels in fine automobiles. Cost: fifteen cents each. The stands themselves were music racks, picked up for a dime apiece in a junk store. Beside the stairway you see a shade which swings in all directions on a swivel to shield the lenses of his many cameras from the direct light of the sun or lamps. That shade once shielded pas-

sengers in a sedan.

Standing in a corner of the dining room, merging with the walls in both color and form, is a barrel on wheels. When swung around, however, the barrel reveals itself as a miniature three-tier bar, with room for twelve glasses and eight bottles. Arquette started with a three-ply packing barrel, sawed out one side to form a "U," added shelves, bound the top with copper weather-stripping, decorated it with large-headed upholsterers' nails, and mounted the fixture on four casters.

Whenever he needs some new device in a hobby he builds it. Not long ago he was taking pictures in his garden, and was having trouble moving his tripod. Two weeks later he rolled his camera down the driveway on a collapsible truck, which resembles a "T" when open, but folds up into a small package. Weighing only a pound and a half, it will support the weight of his heaviest movie camera. By punching a button brake with his foot, he easily locks it in place.

Pursuing a thousand hobbies is Arquette's first interest in life. With them he not only has a lot of fun in his spare time, but tries to keep a step ahead in his profession. No



Arquette at work on some of his marionette characters. Since taking up this hobby, he has worked out several improvements in the construction of puppets

useless trinkets clutter his workbench. "Unless they serve a good purpose, I don't want them," he says—which is pretty good advice for any hobbyist.

Germ-Bearing Mosquitoes Help Treat Mental Cases

A MOSQUITO ranch where insects are raised especially to give malaria to human beings is now in operation in an English mental hospital. Certain types of mental diseases, it is explained, can be successfully treated by giving patients mild cases of malarial fever. Native to England, the mosquitoes in the hospital corral are freshly hatched from eggs, fed for a few days on rabbit's blood, and placed in glass jars, the mouths of which are held against the leg of another patient previously infected with malarial

fever. The insects bite, suck a tiny amount of blood, and thus become malarial germ carriers. Fifteen or twenty of the infected insects are then placed in another open-mouth jar and held against the skin of a mental patient. When they bite, germs are transferred and the patient develops a mild case of malaria, which in many cases is of definite value in treating his mental ailment. The malaria germ used is of a relatively harmless type, originally imported from the island of Madagascar.

Blind Musician

CALLED a "polycorde," a new musical instrument devised by Evangelos Tsamourtzis, blind Greek musician, resembles two harps joined together side by side. Played with both hands, the instrument has sixty-one strings on one side and fifty-six on the other, as well as three foot pedals. Its inventor claims that it can simulate the tones of four or five harps all playing at once. The inventor is pictured at the right playing his novel instrument during a recent demonstration.

U. S. To Build Hospital for Ailing Fish

BOTH commercial and sport fishermen are expected to benefit through increased quantity and quality of their catch when a new hospital for fish is established by the U. S. Department of Commerce. Plans call for erection of the fish hospital at Seattle, Wash., where ailments of fish will be studied by experts.

Devises Double Harp

Played with both hands, this double instrument can simulate the tones of five harps



Big Movie Light Adjustable To Pin-Point Beam

WITH an ingenious arrangement of lenses and a camera-type iris diaphragm, Hollywood technicians have adapted a giant movie spotlight for use in illuminating small scenes from a distance. The light's 1,250,000 candlepower is cut down by the adjustable iris opening, and is then concentrated on a desired spot.

Rigged high in a studio, the big light is used to illuminate distant scenes



Prof. Glen Lukens putting paste into an electric furnace for glazing to bring out the rare color

Calcareous clays from Death Valley, Calif., being ground to make turquoise paste gems like the one in the ring below. This art was practiced by the ancient Egyptians



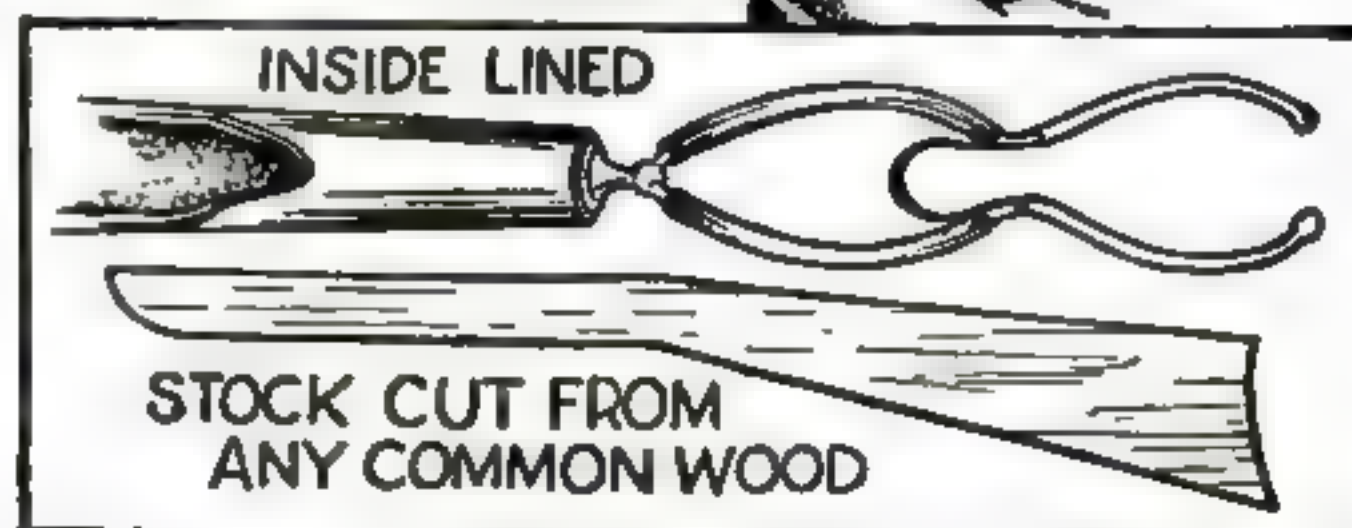
Ancient Gem Mystery Is Solved

LOST for 3,000 years, the secret of making realistic paste imitations of turquoise gems has recently been rediscovered by Prof. Glen Lukens of the University of Southern California. From prehistoric times, turquoise stones have been held to possess supernatural powers as good-luck charms, and the ancient Egyptians, being unable to import them, devised a way to make realistic imitations. After countless experiments extending over a period of ten years, Professor Lukens finally evolved a paste and a glazing method, using materials he discovered in Death Valley, Calif., which exactly reproduce the shade of the Egyptian paste jewels. Years of searching and testing

throughout the Death Valley region where borax mines are located, finally resulted in the discovery of alkaline materials which have the same properties as those used by the Egyptians. Finely ground, these calcareous clays, which contain a high percentage of oxide of copper, are mixed with gum arabic and water. The result, a sticky mass, is next molded to the desired shape. Glazing of the molded material is then accomplished in a special electric furnace at a temperature of 1,300 degrees F. When removed from the furnace, the imitation stones have the rare blue tint that has not been produced by human hands for thirty centuries.

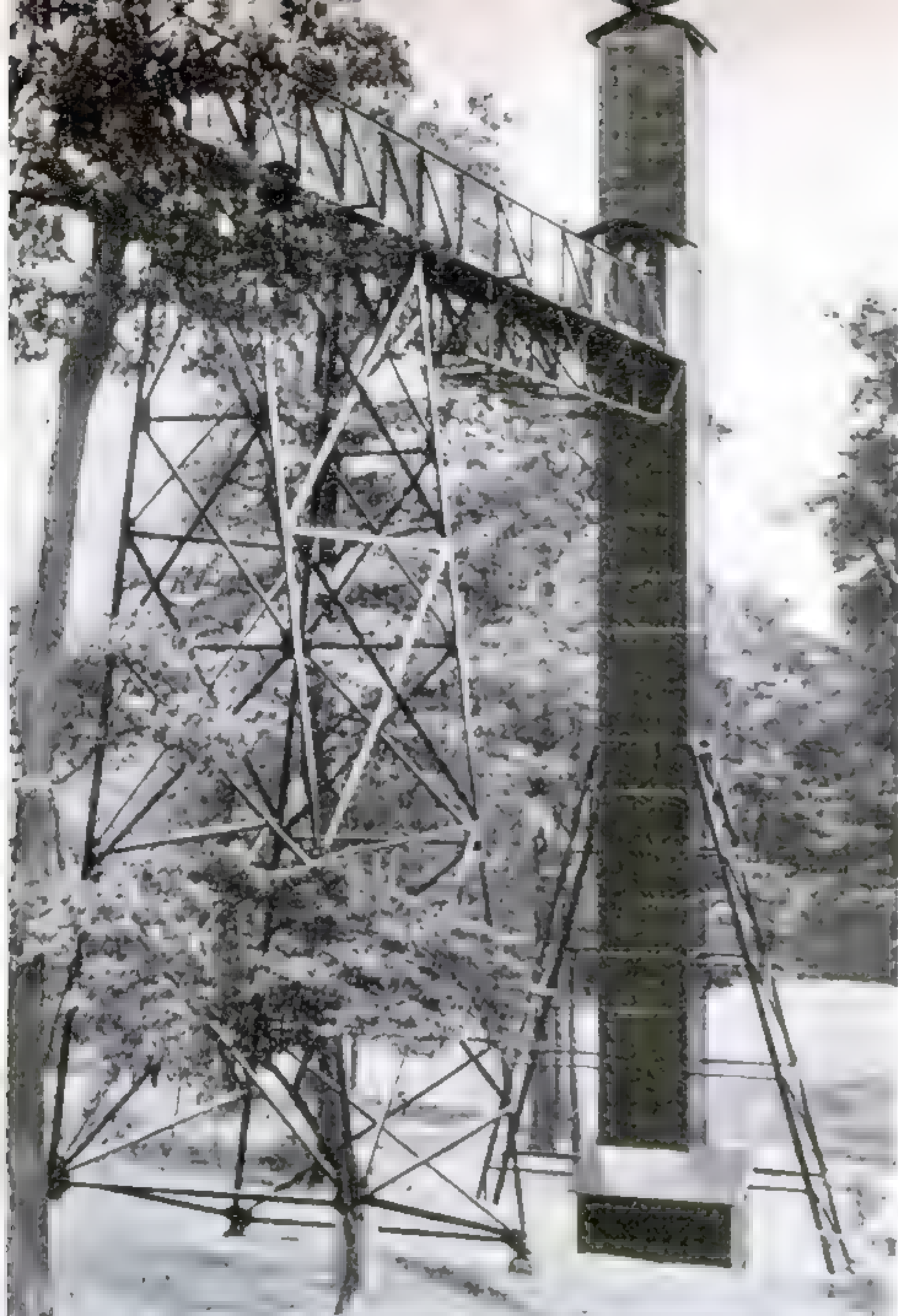
Homemade Listening Device Uses Doctor's Stethoscope

AN INGENIOUS directional sound detector invented by Dr. J. E. Guy of Washington, D.C., enables the user to "tune in" specific sounds of average volume that originate fifty feet away. Mounted on a wooden stock, the device consists of a felt-lined tapering cylinder of light cardboard, whose smaller end is fitted over the bell of a diaphragm stethoscope. The detector is aimed like a gun, the sound coming to the listener through the stethoscope earpieces.

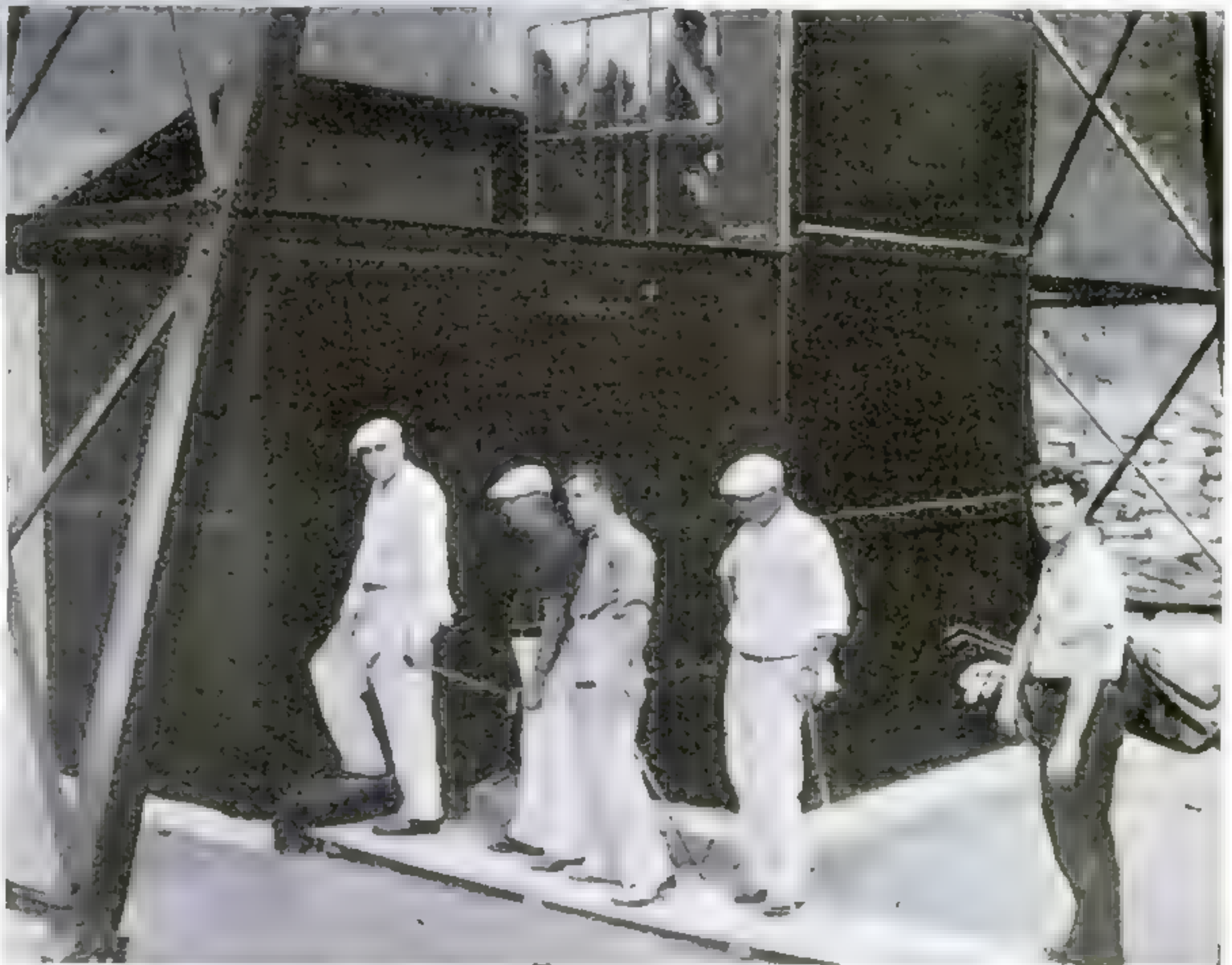


Elevator Suits Golfers To a Tee

TO SPARE its members the exertion of climbing a hill, the Pittsburgh, Pa., Field Club has installed an elevator in the middle of a golf course. When a player has finished at the seventeenth hole, he steps into the elevator and is lifted sixty-four feet to an elevated runway. This 274-foot trestle extends horizontally to the crown of the hill and the tee from which play is started for the eighteenth hole. Formerly the tee was at the bottom of the steep hill, and the golfers, especially the more portly ones, objected to the stiffness of the climb. Now the club's members, who include many of the industrial magnates and society leaders of the Steel City, have no more reason to complain, since they are assured of a "lift" just before they start the final hole.



This sixty-four-foot elevator saves golfers at the Field Club, in Pittsburgh, Pa., the trouble of climbing a steep hill. At right, a group of players is entering the shaft to be whisked to the top





Over she goes! Standing on the gunwale of their lifeboat, men of the U.S. Coast Guard pull on ropes attached to the opposite side

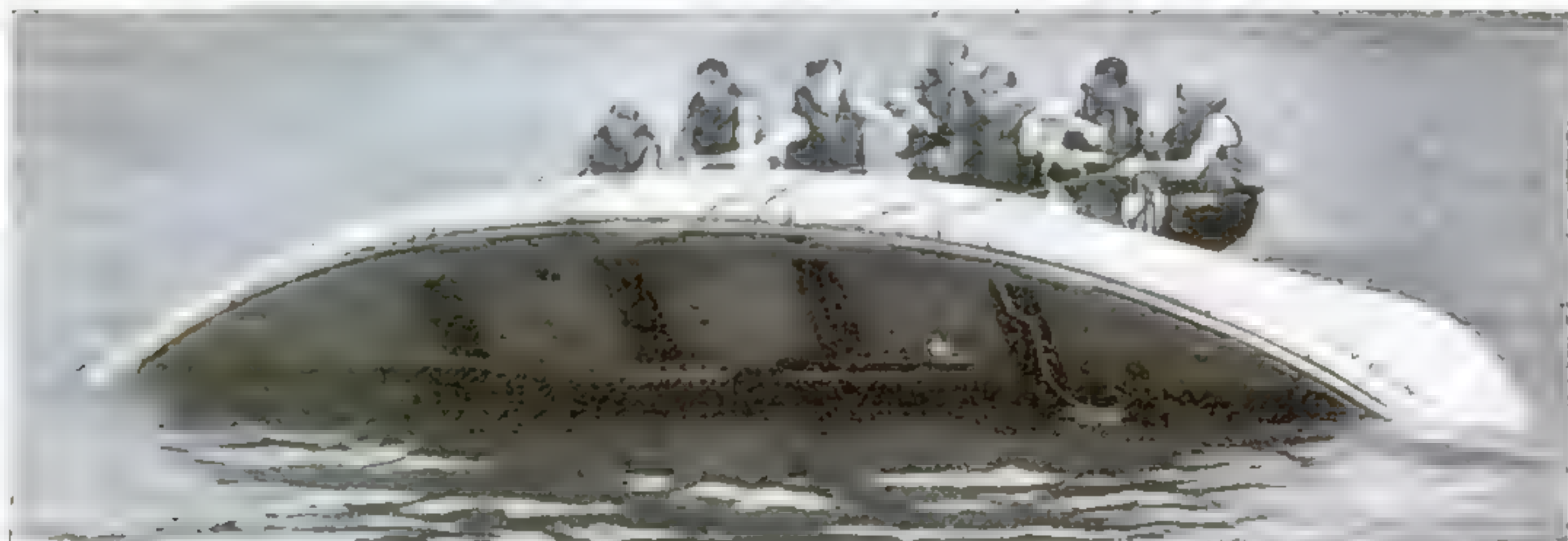
As the craft capsizes, they grasp the edge of the boat and climb up onto its rounded bottom as at the right



Coast Guards Capsize Boats in Odd Race

CREWS representing six district units of the United States Coast Guard recently vied in a novel capsizing race in the harbor of New York City. At a signal, the seven men of each crew took in their oars, lashed ropes

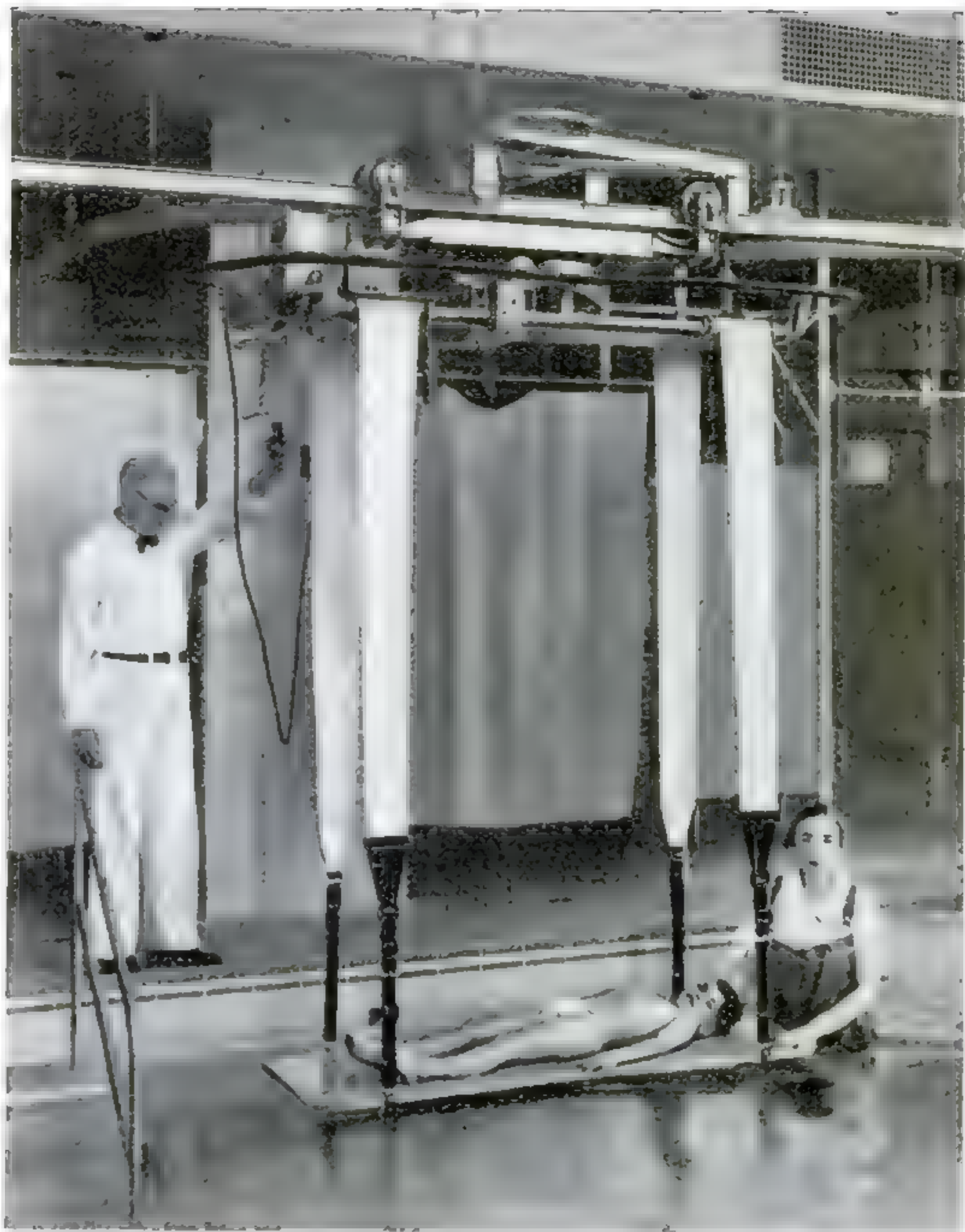
to one gunwale, stood on the opposite side, and pulled their 1,600-pound lifeboat over. Then, clambering onto the bottom of the cap-sized boat, they righted the self-bailing craft again by hauling on the gunwale ropes.



Hauling on the ropes again, they pull the self-bailing boat back over, and clamber into their places

Patients Ride Monorail Car in Hospital

PATIENTS suffering from infantile paralysis are easily transferred from their hospital beds to treatment rooms or to a pool for physiotherapy exercises by means of an ingenious monorail system just developed. At the patient's bedside he is lifted onto a stretcher suspended on straps that are raised or lowered either by a hand crank or by an electric motor on the overhead car that runs on a single track hung from the ceiling. Wheeled along the hospital corridors on the monorail track, the patient is taken to the treatment pool where the apparatus swings out over the water and the patient is slowly lowered for underwater exercises, making it easier for both the patient and the attendants.



Paralysis patient being lowered into pool from monorail car for exercises



This apiary expert is trimming the wings of drone bees

Bees' Wings Clipped So They'll Stay Home

WHILE conducting a series of breeding experiments designed to develop hardier and more productive bees, apiary experts at a U. S. Department of Agriculture experiment station at Beltsville, Md., are clipping the wings of drone bees in order to discourage them from flying away from their hives. When a colony of bees is transferred from one hive to another, it is explained, the queen bee and the workers settle down in their new home with little trouble, but the drones keep trying to escape. In the photograph reproduced at the left, Frank E. Meachum of the Beltsville experimental staff is shown at work using a pair of nail scissors to clip the wings of a drone for one of the experiments.

POPULAR SCIENCE *Question Bee*

Don't believe everything you see in the numbered paragraphs below. Try to pick out the correct answer in each case and jot down the letter corresponding to it. Check your results on page 252



1 Tent caterpillars attack (a) the fabric of canvas tents (b) the foliage of fruit trees (c) every living thing as they march through the jungle.

2 Betelgeuse is the name of (a) a nut chewed by natives of the East Indies (b) the most heavily fortified city on the Franco-German border (c) a giant star (d) the discoverer of X rays.

3 You would use the B & S gauge to specify (a) the bore and stroke of an automobile engine (b) the width of railway tracks (c) the thickness of a copper wire (d) the size of perforations on postage stamps.

4 Mattresses are often stuffed with (a) bagasse (b) oakum (c) kapok (d) basalt.

5 A horizontal tunnel in a mine is called a (a) drift (b) stope (c) countershaft (d) drawtube (e) hawse hole.

6 Artillerymen use (a) direction finders (b) range finders (c) view finders.

7 Many years ago there lived a huge flying reptile called the (a) thesaurus (b) phoenix (c) pterodactyl (d) Tyrannosaurus.

8 A suitable Christmas present for an amateur photographer would be (a) a whippet tank (b) an exposure meter (c) garnet paper (d) swash plates (e) Very lights.

9 Passing an electric current through the ground is one of the modern methods employed in (a) making it rain (b) prospecting for minerals (c) guarding citrous orchards from frost (d) campaigning against enemy tribes who go barefoot.

10 When a perfectly balanced coin has come up "heads" ten times in succession, your chances of tossing a "tails" the next time are (a) good (b) bad (c) fifty-fifty.

11 Detached from the body, whole organs of animals are kept alive for study in the (a) Carrel-Lindbergh pump (b) iron lung (c) Petri dish (d) Florence flask.

12 Lapidaries (a) believe the earth is flat (b) travel long distances up rivers to lay their eggs (c) are hurled from erupting volcanoes (d) cut precious stones (e) rank among the fleetest of camels.

13 Machine nuts often are kept from loosening by means of (a) burette clamps (b) ring binders (c) lock washers (d) slide fasteners.

14 You will find exactly the same stuff that a diamond is made of in (a) a lump of coal (b) a bar of gold (c) a crystal of quartz (d) a bag of salt.

15 The acceleration of your car can be expressed in (a) foot pounds (b) horsepower (c) miles an hour (d) feet a second a second.

16 One of the poison gases used in modern warfare is (a) laughing gas (b) mustard gas (c) helium gas (d) Blau gas (e) water gas.

17 If a whole string of Christmas-tree lamp bulbs goes out when you unscrew one of them, they are connected in (a) parallel (b) series (c) opposition (d) conjunction.

18 Electric bulbs containing magnesium metal and oxygen have lately come into use for (a) illuminating highways (b) aiding long-distance radio reception (c) taking flash-light photographs.

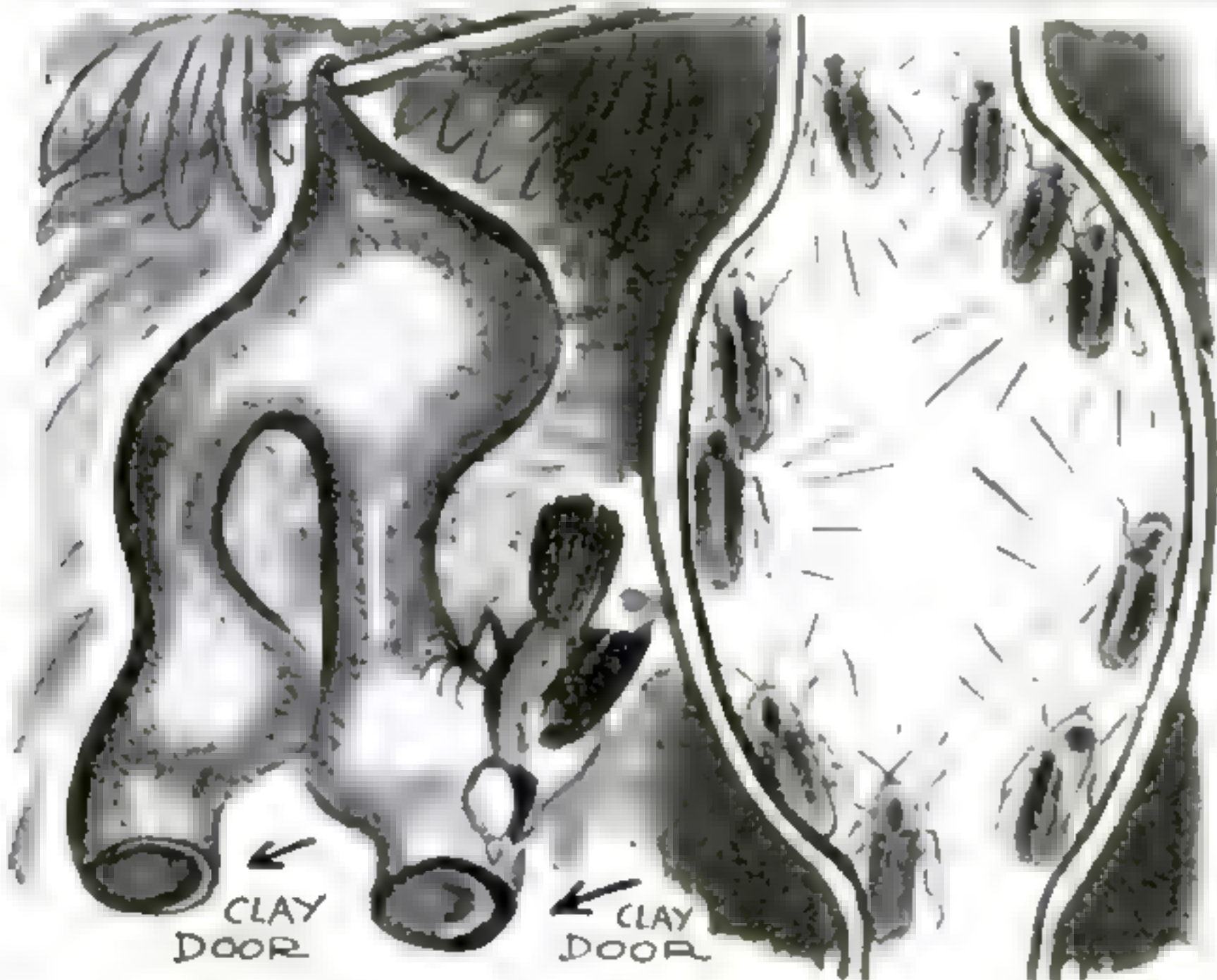
19 Pyrethrum is used as (a) a photographic developer (b) an insecticide (c) a fire-extinguishing liquid (d) a cure for malaria.

20 The things that tip an airplane on its side for banking are called (a) elevators (b) ailerons (c) pectoral fins (d) paravanes.

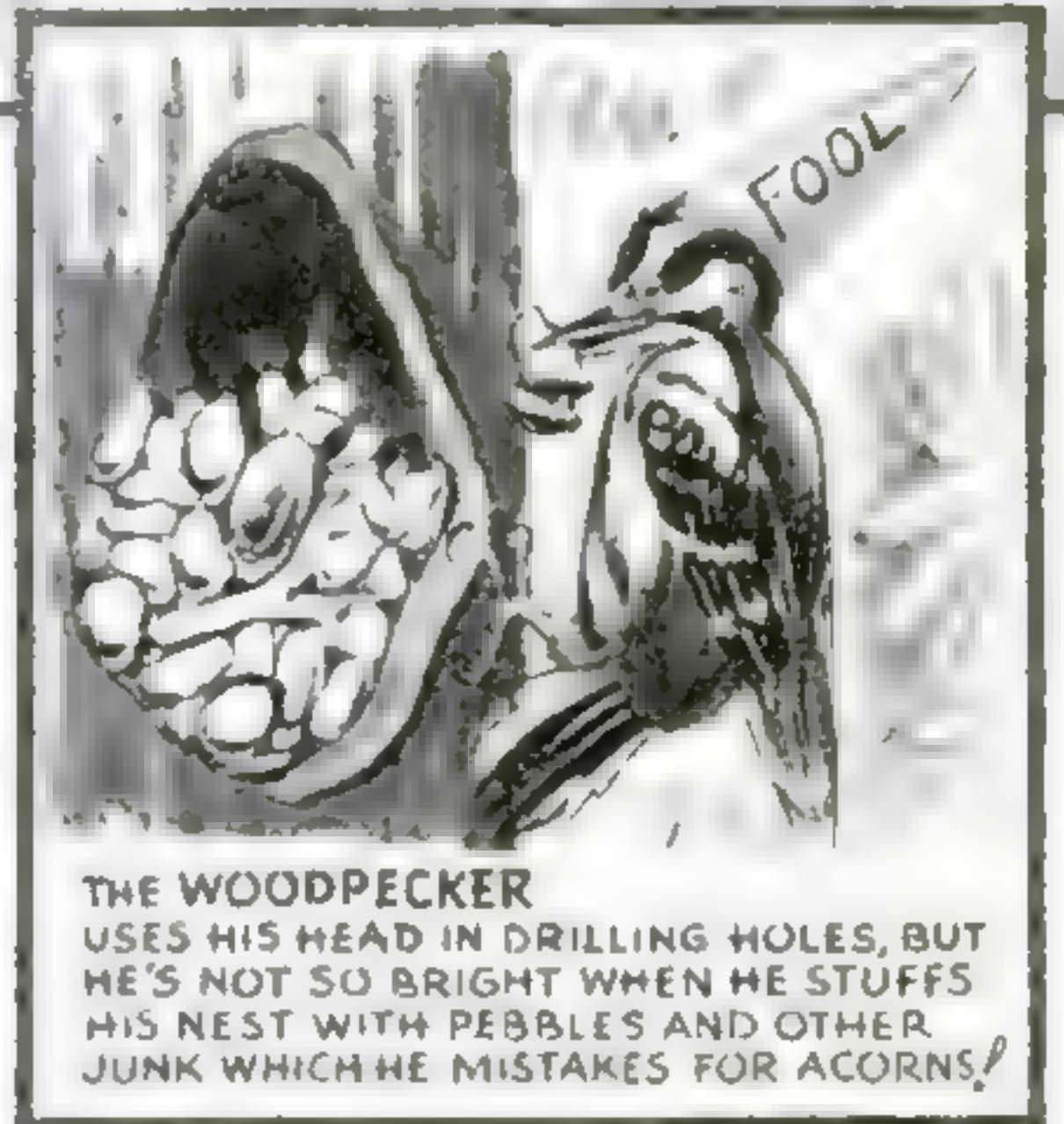
Un-Natural History By GUS MAGER



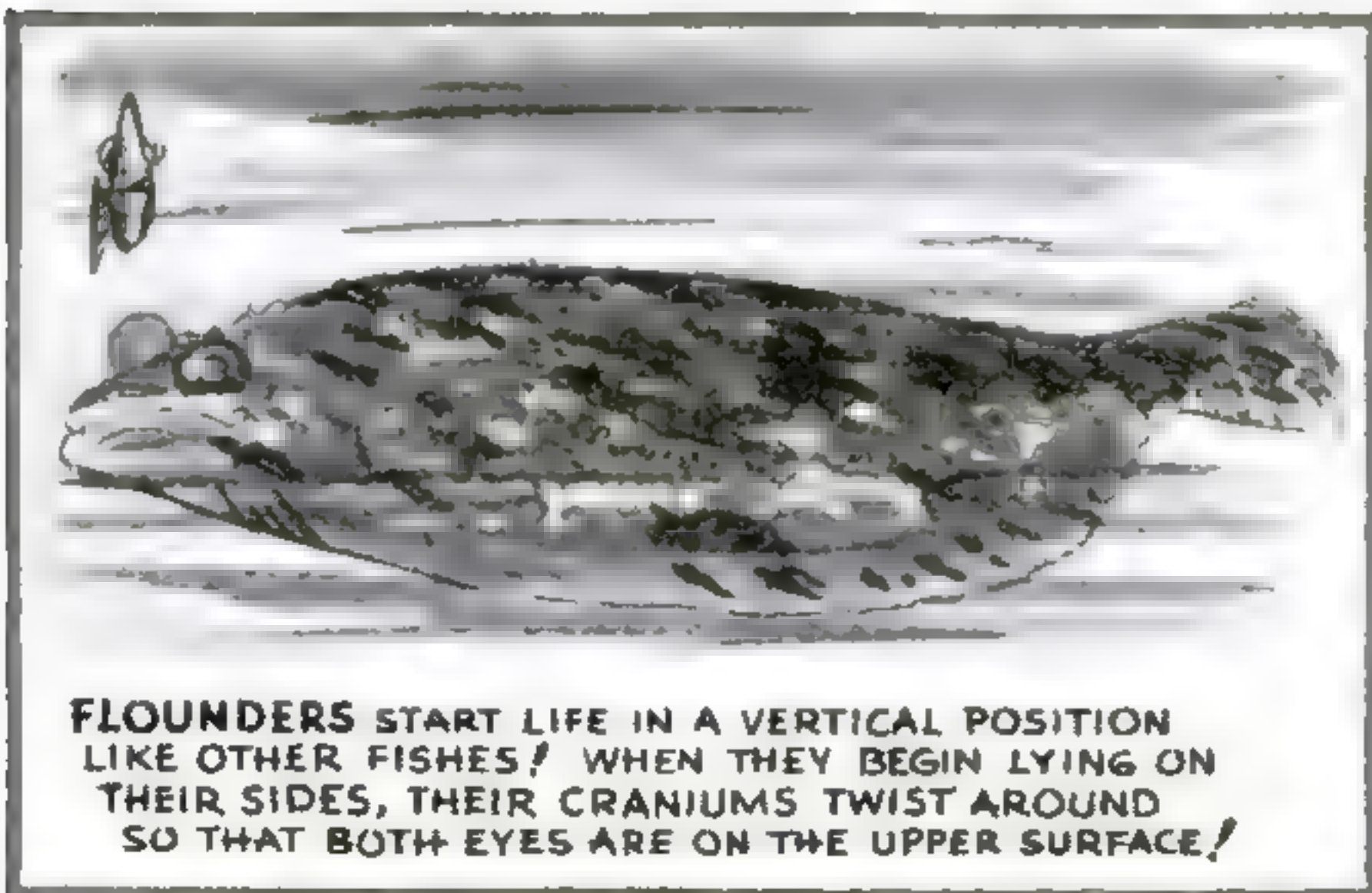
HUNTERS SAY THAT ZEBRAS, ANTELOPES, AND OTHER NIGHTTIME PREY OF THE LION, ARE NOT AFRAID OF HIM BY DAY! WHEN HE APPROACHES A HERD THEY MERELY CLEAR A PATH FOR HIM!



BAYA WEAVER BIRDS OF INDIA ILLUMINATE THE INTERIORS OF THEIR ASTONISHING WOVEN, CLAY-DOORED NESTS WITH GLEAMING FIREFLIES!



THE WOODPECKER USES HIS HEAD IN DRILLING HOLES, BUT HE'S NOT SO BRIGHT WHEN HE STUFFS HIS NEST WITH PEBBLES AND OTHER JUNK WHICH HE MISTAKES FOR ACORNS!

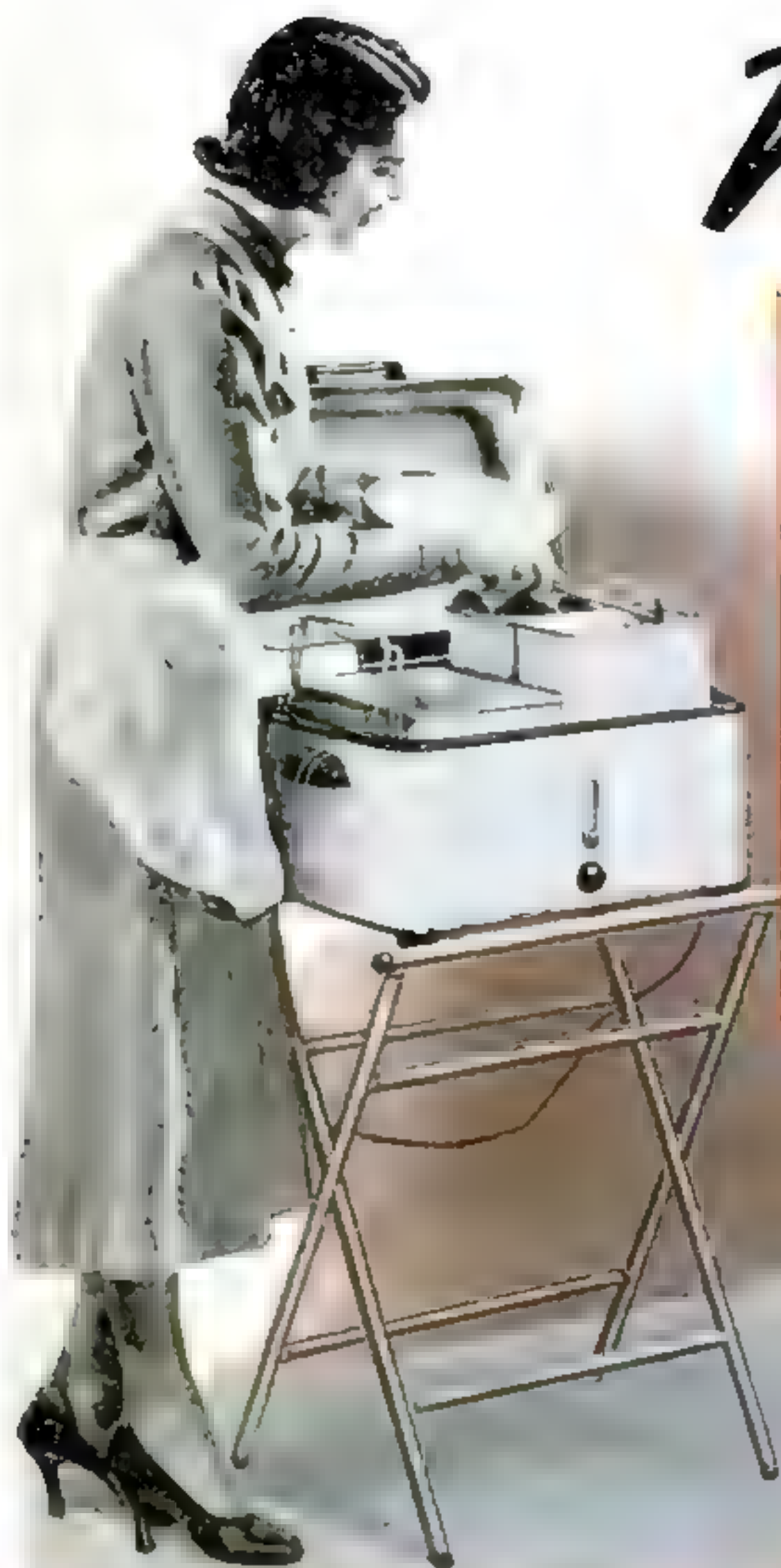


FLOUNDERS START LIFE IN A VERTICAL POSITION LIKE OTHER FISHES! WHEN THEY BEGIN LYING ON THEIR SIDES, THEIR CRANIUMS TWIST AROUND SO THAT BOTH EYES ARE ON THE UPPER SURFACE!



IN TROPICAL COUNTRIES, HUGE ARMIES OF LAND HERMIT CRABS TRAVEL ACROSS COUNTRY ONCE A YEAR, GUIDED BY A MYSTERIOUS SENSE OF DIRECTION THAT LEADS THEM TO THE NEAREST SEACOAST TO LAY THEIR EGGS!

New Inventions



COOKING CHEST

Three full meals a day can be prepared, if desired, on the compact electric cooker illustrated at far left. It is plugged into any convenient outlet. A special feature is the detachable broiler unit with chrome reflector surfaces seen at left



TOOTH-PASTE HOLDER

When tooth-paste and shaving-cream tubes are kept in this handy rack, caps are left off



MUSTARD DISPENSER

Mustard drips in neat dabs from the lower end of this glass container when the rubber top is pressed. A base of plastic material holds it when it is not being used



ROOM HEATER

Turned on and off by an automatic timer clock, the electric heater at the left is handy for early risers who want their rooms warm when they wake up



TOASTER IS EASY TO CLEAN. By sliding a button on the base of this electric toaster, the housewife can lift off the upper part to wipe off accumulated crumbs and clean the metal



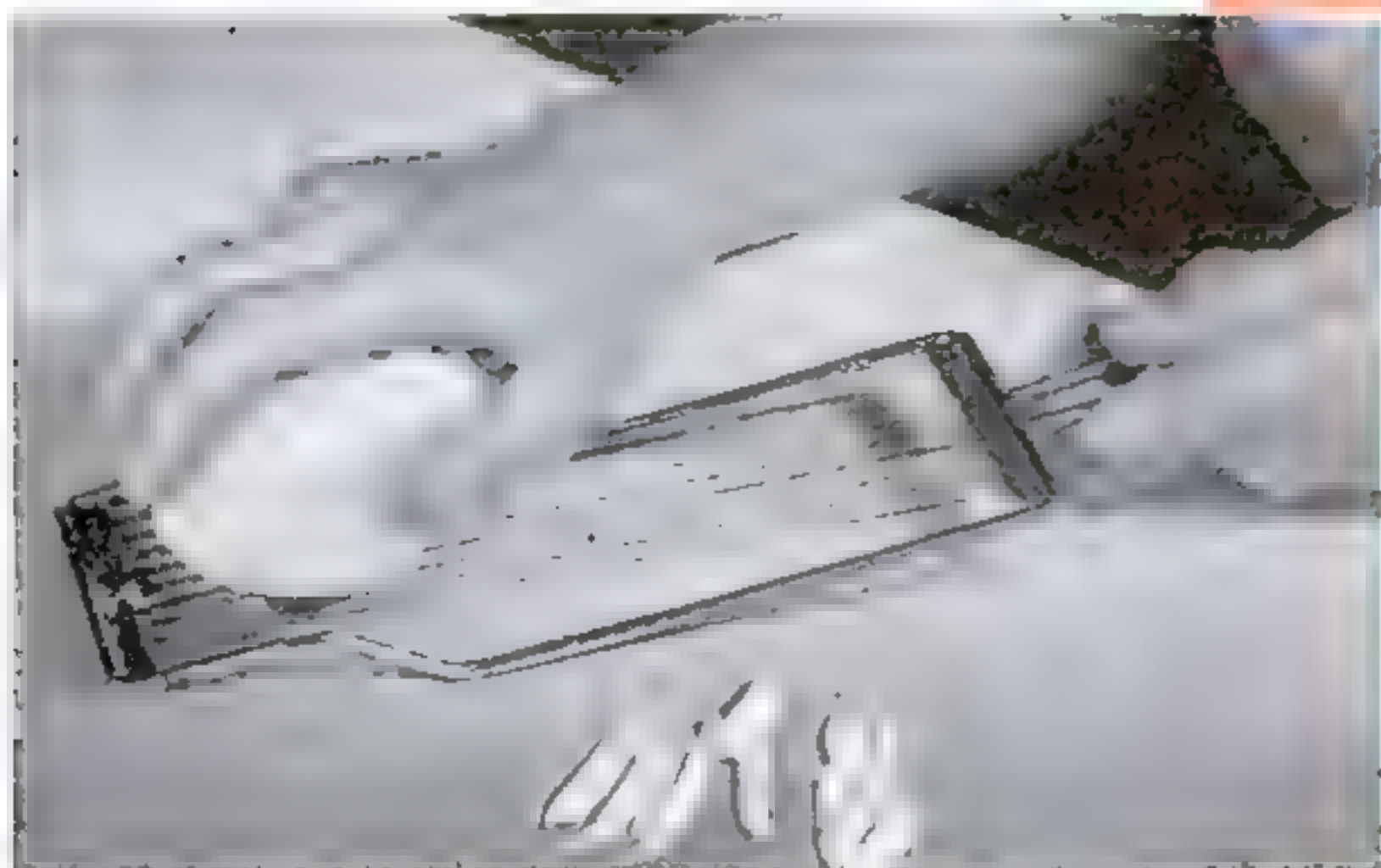
Lighten Home Chores

SPILLPROOF DRAIN LID. Painful burns are prevented by the drain lid shown below, which locks on a standard cooking utensil. Food is held in the vessel while the water is drained off, eliminating the need for a colander



TEACUP MIXER. For beating eggs and mixing small quantities of salad dressing, frosting, or sauce, this spiral-wire beater is used in a cup

POTATO CUTTER. By sliding a potato or other vegetable along the fine steel wires and across the cutting blade of the tool below, shoe-string slices are easily produced



SPIRAL SLICER. When the screw of this novel cutter is inserted in the end of a piece of fruit or vegetable, and the blade is turned with the hand, it makes an attractive spiral slice for garnishing a roast or a salad

Dr. Foley got out. Gus held up the detached muffler for his inspection. When he tapped it with a wrench, it gave off a curiously dull sound. "It's frozen," he said



Gus Cures Some Winter Ills

GUS WILSON drove up to the shop door of the Model Garage much earlier than usual that cold, late-November morning, but not so early that he didn't meet his partner, Joe Clark, as he hopped out of his car and hurried around to the office door.

They didn't do more than exchange amiable grunts of greeting until Joe had unlocked the door and they were in the warm little office. Then they grinned at each other.

"I'm relieved to see that that new oil heater of yours does its job," Gus said. "By golly, the old mercury sure went into a nose dive last night. It was down to twelve above, 'long about three o'clock, the traffic cop up at the circle told me. It's not more than a notch or

two above twenty now. I'm betting that we're going to have a busy morning."

Joe Clark nodded. "Sure to," he agreed. "For the last two weeks I've been telling every customer that I've seen that he'd better get antifreeze in his radiator and have his oil changed, but it has been so warm that a lot of them have kept on putting it off. Now this cold snap cracking down on us like this is going to have the putters-off right up to their chins in grief."

The telephone rang noisily.

"It's starting," Gus said. "Answer it, Joe, will you? I just haven't got the heart."

He went into the shop and began changing into his working clothes. In a couple of minutes Joe stuck his head in at the door,

"Might have known it!" he said, grinning widely. "It was Mrs. Miller. Says her radiator is frozen solid, and will we send some one over right away to get her car started? Henry's been out of town, and she left their bus out in their driveway all night—meant to put it in the garage, but forgot it, of course. Well, I've got to call her back. What'll I tell her?"

"Tell her we'll have to thaw her radiator out over here," Gus said. "I'll send Harry up with the wrecker to get her car as soon as he shows up."

A car had stopped outside and its driver was walking into the shop—a big man whose red, weather-beaten face looked over the upturned collar of a fuzzy old ulster. He gave the Model Garage partners a stare and demanded gruffly: "Which one of you fellows is Gus Wilson?"

"I am," Gus told him.

"My name's Higgs," the newcomer said. "I'm from upstate a ways—building contractor. I'm having trouble with my darned car. I can't figure out what's the matter with it, and neither can anyone else—although in the last couple of hours two garage men have taken my money for trying. Up the road a piece she went dead on me again, and while I was trying to get her going a motorcycle cop comes along. 'Gus Wilson, down at the Model Garage, is your best bet,' he told me. 'He's a trouble-shooter from 'way back.' So here I am."

"Glad to have you," said Gus. "Well, what's your trouble?"

"What's my trouble," Higgs answered, "is what I want to know. All I can tell you is what *ain't* the matter with my car. She ain't froze, because I had her filled up with anti-freeze last week. There's nothing the matter with the oil or grease, because I had 'em changed only yesterday. The battery's all right—got a kick like an army mule. She ain't exactly what you'd call a new car. I bought her secondhand back in '34, and she's got seventy-some thousand on her. But she never acted up on me like she's done this morning."

"I've got some important business to attend to in the city, so I left home before six—been over two hours coming thirty miles! About five miles from home, I was going along all right, doing maybe forty-five, when all of a sudden the car slowed down. Pretty soon she was just crawling along, and then, when she got to the top of a hill, she stopped dead."

"I got out, and opened up the hood, and

The Season's First Real Freeze Brings Three Cars with Mysterious Ailments to the Model Garage

By

MARTIN BUNN

felt the plugs and the engine and the bottom of the radiator. They all felt nice and warm—which was a heck of a lot more than I did, with that icy-cold wind trying to blow both me and the bus back down the hill. I couldn't see anything wrong, so I got in again, turned the key, and stepped on the starter. And she started, and ran along fine!

"Everything was all right—for maybe two miles. Then she slowed down again. This time I just made an all-night

garage before she went dead again. The mechanic and I pushed her in, and then he went over the plugs and the wiring, same as I had. 'Try it now,' he said after he'd fooled around for a while. I did, and she started nice and easy, and ran fine. 'That'll be a half a dollar,' he told me, so I paid him and drove off.

"But after a couple of miles, she began to slow down again. I was going through a town, and I made it to a garage. The fellow there listened to what I had to say, and then said that the trouble was that there was water in the carburetor. So he took the carburetor off, blew it out, put it on again, and charged me a dollar! I just made it to your place—motor went dead right at your door. Now, what I want to know is what the heck—"

"Drive your car into the shop," Gus interrupted. "I'll soon fix it up so that it will *stay* fixed."

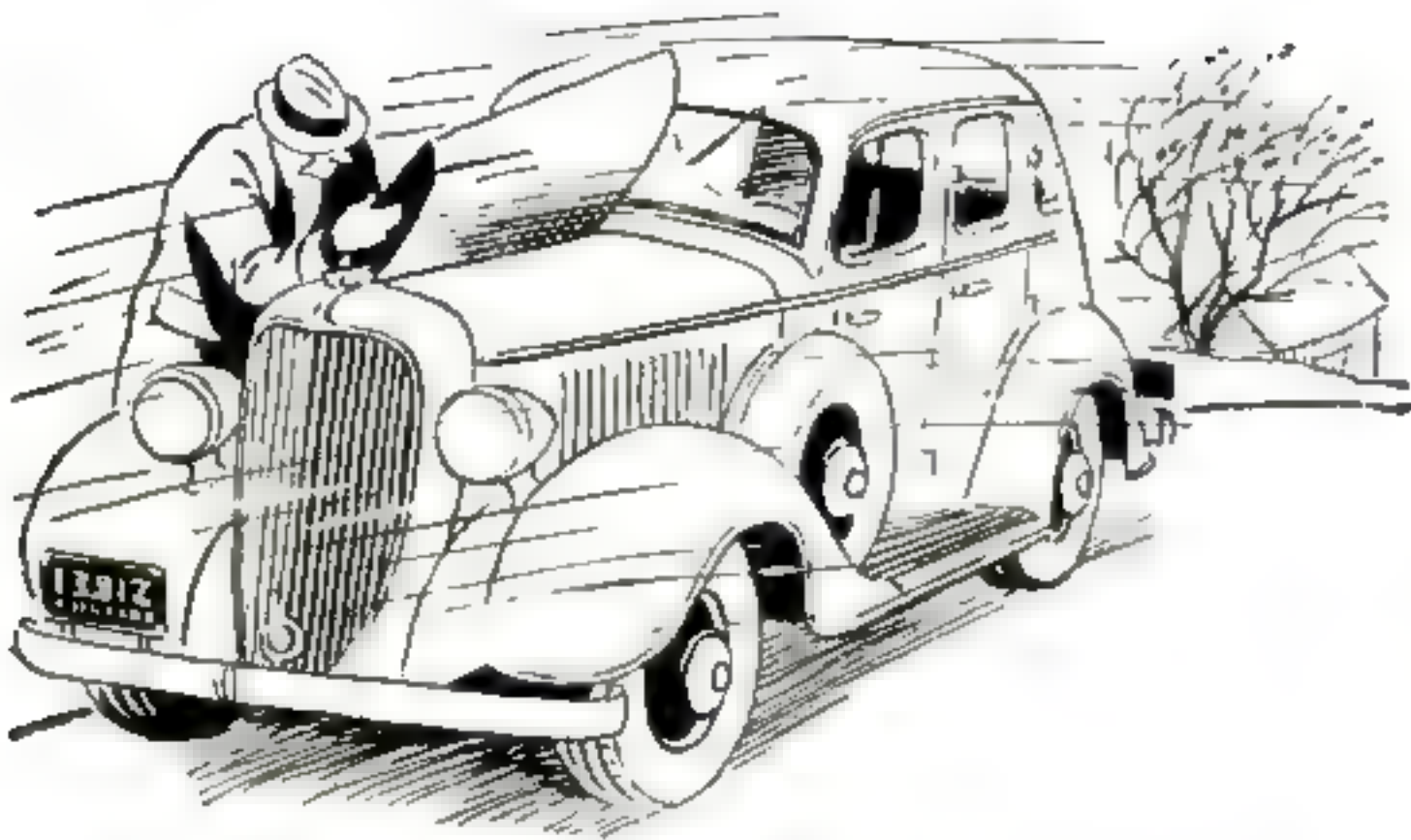
"You'll have to give me a hand," Higgs retorted. "I told you she'd gone dead. We'll have to push her in—unless maybe she's changed her mind again."

Gus grinned. "You step on the starter and she'll run all right," he stated confidently.

Higgs drove in, looking disgusted.

"That fellow who said that the trouble was water in the carburetor was almost—but not quite—right," Gus told him. "What happened was that the rush of cold air blowing around the carburetor—especially while you were bucking that icy head wind that you told me about—got it so cold that the moisture in the carburetor froze and built up a little plug of ice around the jet. When that plug got big enough it closed the opening and, of course, shut off the gas, and your engine stopped. As soon as your car stopped moving, the freezing rush of cold air stopped too—or at least became less strong. Then the heat from the engine had a chance to warm up the carburetor enough to melt the little ice plug. And as soon as that happened, your car ran all right again."

"I'll be darned!" Higgs exclaimed. "But say—you haven't looked under the hood. Are



"I opened the hood. Plugs and engine felt nice and warm—which was a heck of a lot more than I did!"

you certain that you're right about this?"

"Dead certain," Gus assured him.

"Well, then," Higgs continued, "now you know what's the matter, what are you going to do about fixing it?"

"That's easy," Gus said. He took off the air filter, attached a length of flexible tubing to the air intake of the carburetor, and then made the tubing fast alongside the exhaust pipe and manifold. "There you are, Mr. Higgs," he said when he had finished. "Now you'll get warmed air in your carburetor no matter what happens, and you won't have any more trouble. Am I sure? Sure I'm sure! If it doesn't work, stop in on your way home and I'll give you back your money!"

As Higgs drove on his way, Harry came in, towing the Miller car. But before he was able to get started on the job, Joe's voice sounded from the office. "Hey, Gus! Send the wrecker over to Doc Foley's house. He says he can't start his car and wants you to tow it in."

"Go get it," Gus told Harry.

In ten minutes Harry was back, with Dr. Foley at the wheel of the car being towed. "Can't imagine what has gone wrong," the doctor said when he got out. "I've taken all the cold-weather precautions that your partner suggested, Mr. Wilson—my garage is unheated, you know. The car was running well when I came in from some calls late yesterday evening, but this morning I can't get it to start. It turned over two or three times when I stepped on the starter, and then quit cold."

"Try it again, Doc," Gus said. "Throw your clutch out. No use using up your battery making it turn the transmission gears in grease that's so thick it's pretty nearly solid."

Dr. Foley nodded, and pressed the starter pedal. The engine coughed weakly three or four times, and then stopped. "Once more, please," called Gus, who had walked around back of the car. The same thing happened, only the coughs were weaker.

"Hand me that wrench, will you, Harry?"

Gus said as he crawled under the car. Some minutes later he emerged with the car's muffler in his hand. "Now try again, Doc."

This time the engine started with a roar. "All right," Gus yelled over the noise. "Switch it off."

Dr. Foley got out, and Gus held up the detached muffler for his inspection. When he tapped it with the wrench, it gave off a curiously dull sound.

"Frozen!" Gus said. "See what's happened? It was so cold last evening that vapor—exhaust gases are mostly vapor, you know—kept condensing in the muffler and freezing there. You didn't drive far enough between your calls to heat up the muffler and melt the ice or drive it out; and while the car was standing in your unheated garage overnight, the muffler froze to such an extent that when you started the engine, the back pressure soon stalled it."

"Some mufflers have a small hole drilled in the bottom to allow that moisture to run out. But I'll tell you something that is a lot more certain than that hole is to do the job, Doc. Just remember, in cold weather, to race your engine for a few seconds before you shut it off. That will blow out any moisture that has accumulated in the muffler. All right, Harry, get Dr. Foley's muffler thawed out, and put it back on his car, so that he can be on his way."

Along about five o'clock that afternoon, Mrs. Miller came in on the verge of tears—and drove out smiling happily because her car wasn't ruined after all, and because her chronic forgetfulness wasn't going to cost her long-suffering spouse anything more than the charge for the time that Harry had spent in slowly thawing out the frozen radiator.

Just then a horn honked insistently outside the shop door. Joe went over and looked out of the window. "It's young Jim Jelliff," he said, as Gus opened the doors to allow a small business coupe to enter. The young man who got out of it looked badly worried. "Hello, fellows," he said. "Looks like I'm in real trouble this trip."

"Why," Gus said, *(Continued on page 244)*



Gus took the cap off the oil-filler tube—and began to laugh. "Here's your repair job!" he said

THE HOME WORKSHOP



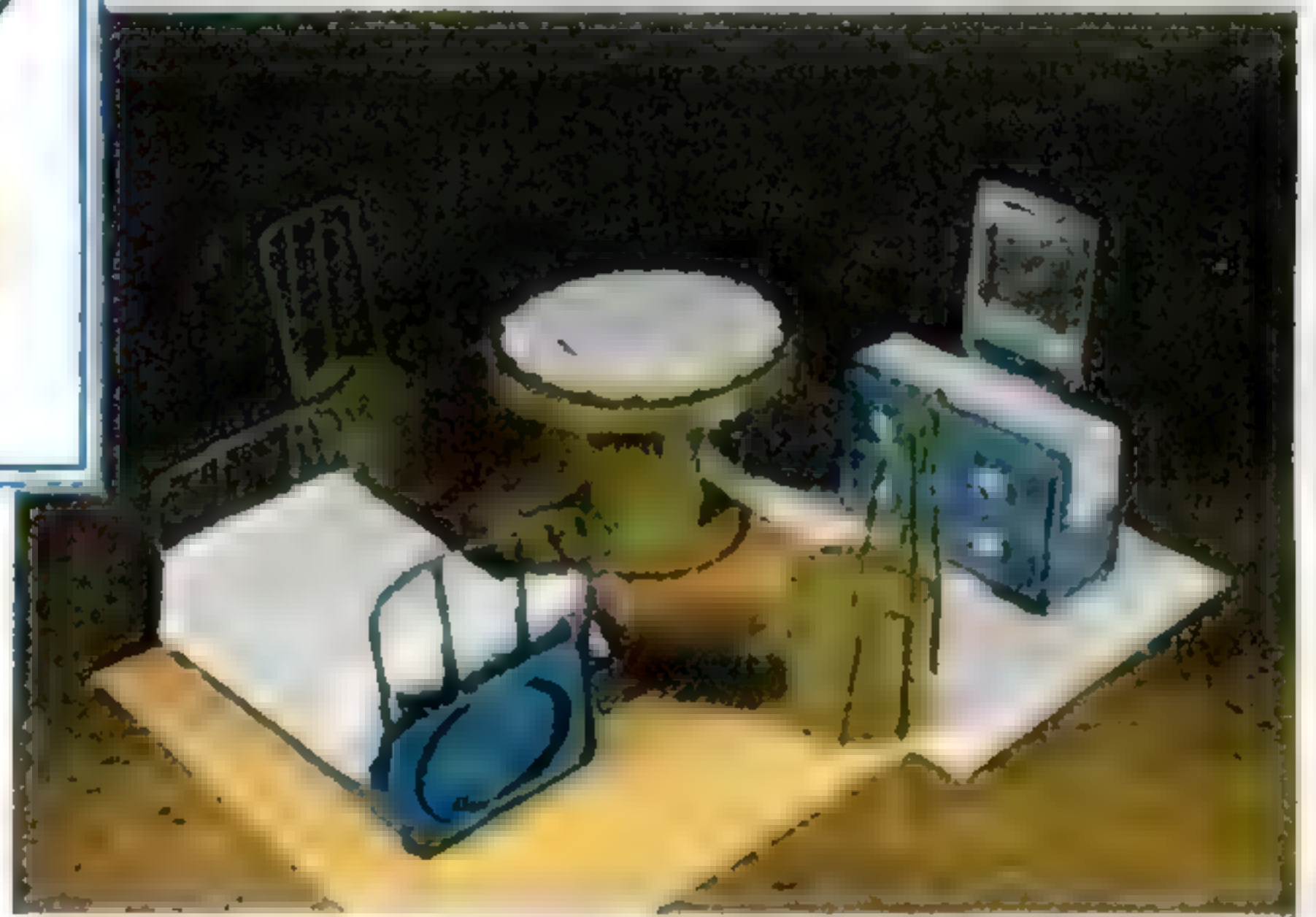
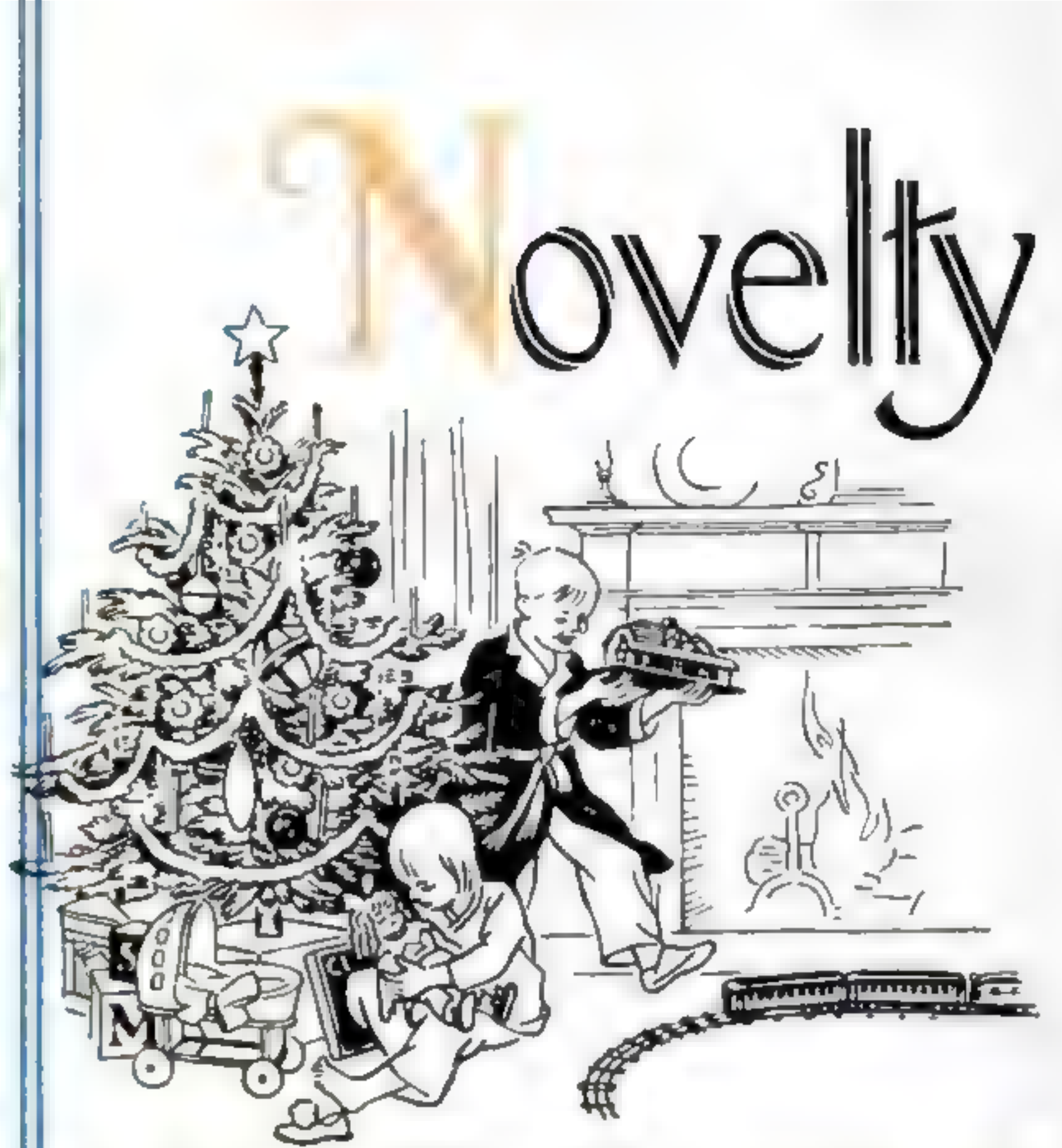
*This
Issue*

CHRISTMAS CRAFTWORK - FURNITURE GOOFY-BIRD CONTEST

TRICK PHOTO PORTRAIT : MODELS : FOOTBALL FAN'S BARRIO



This colorful and amusing sea-lion platter is particularly easy to make. The sea lion is of wood, mounted on a plain blue plate



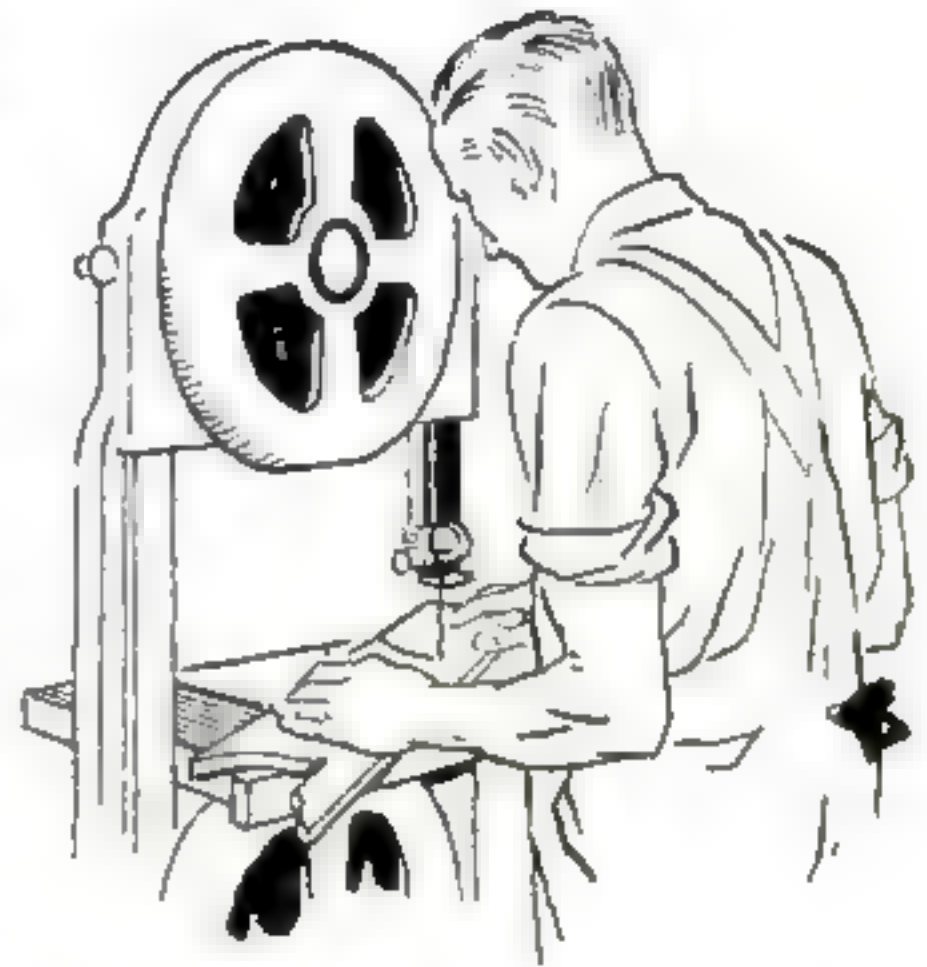
Toy furniture made of tin cans and wire. Left, a brilliant-hued dispenser for wrapping cord. Beneath it is a door bumper turned into a safety-pin holder. Below, a jigsawed burro carries a miniature cactus. At right, a roping cowboy



Gifts for Christmas

AS CHRISTMAS draws near, home workshops everywhere are being geared to high speed in the production of gift craftwork. The cheerful sound of hammer and saw resounds through the house; the pleasant odor of fresh shavings pervades the basement; and the hum and whir of power-driven tools provide background music for all the merry activity.

But first there is always that old, puzzling question to answer: "What can I make this year that is novel, colorful, useful, and just right for gift purposes?" To help solve this problem, we have selected a variety of unusual projects from the hundreds of designs submitted during the past year. These are all quite easy to make, require little material, and have a handmade, eye-catching quality that will make them stand out among any gifts.



Sea Lion Balances Dainties Above Sea of Sandwiches

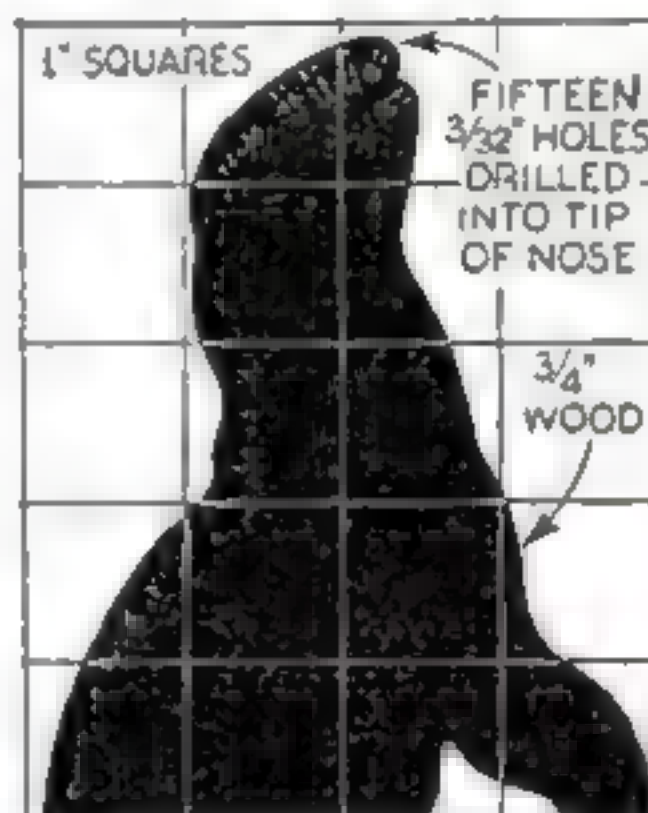
FOR serving sandwiches, small sausages, olives, and other dainties, a colorful platter like the one illustrated at the upper left of group of projects on the facing page will greatly enhance the table.

Lay out the sea-lion design as shown in the accompanying diagram on a piece of $\frac{3}{4}$ " wood and cut with a jig saw or coping saw. Drill the five rows of $\frac{3}{32}$ " holes on the lion's nose so that the toothpicks, when inserted, will be in a fan arrangement. Sandpaper the figure thoroughly and cover with several coats of black paint or enamel.

Obtain an aquamarine-colored plate about 12" in diameter to create the impres-

sion of a natural setting for the sea lion, and drill a hole through the center for attaching the figure with a wood screw. The hole may be bored with a 5" three-square file, which is quickly prepared for that purpose. Just break off the end and grind down the three sides with beveled faces to a point with an emery wheel or a grindstone, being careful not to destroy the temper of the file.

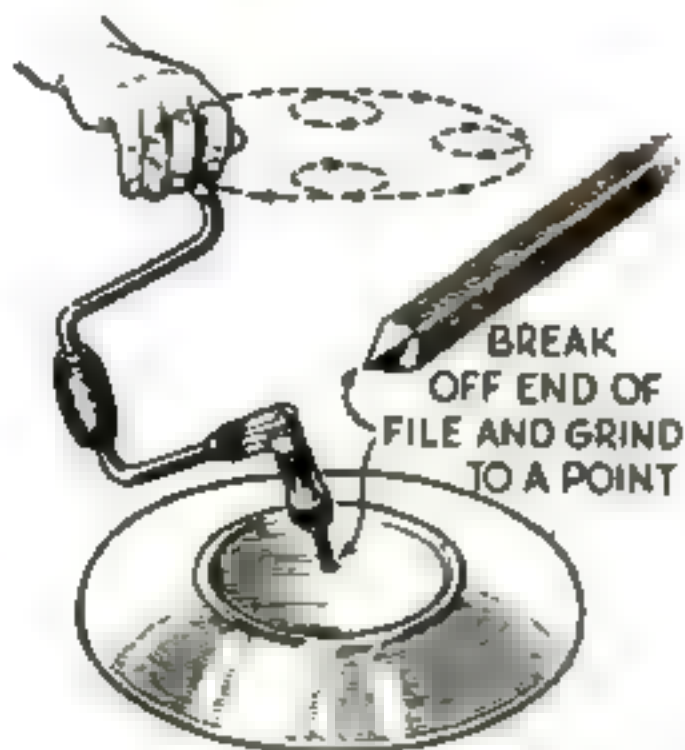
Now place the file in a brace and proceed to drill the hole by whirling the brace with one hand as sketched on the following page. Hold the plate firmly on a small block of wood set under the center. Apply a little turpentine to the point of the file as



Toy garden furniture, Mexican style. This set and the tin-can pieces are described on pages 164-165

the drilling progresses. If trouble is experienced in starting the drill, scratch the plate surface with the drill point before using the brace. As soon as the point pierces the underside of the plate, turn the plate over and finish the hole from the opposite side.

If you have facilities for large faceplate turning, you may prefer making the plate from wood and painting it. Turn several ridges on the face of the plate to simulate waves. Attach the sea lion to the plate with a round-head wood screw. Place a lead washer or a washer cut from thin leather under the head of the screw to act as a cushion.—**GEORGE A. SMITH.**



How the pointed end of a file is used to drill the hole in the plate

Door Bumper Transformed into Safety-Pin Holder

DINAH, who carries a generous supply of safety pins in her capacious earrings, was once an ordinary wooden door bumper or base knob, and her earrings were plain curtain pulls. Cut a circle $2\frac{1}{2}$ " in diameter from wood $1\frac{1}{8}$ " thick and slightly round its upper edge. Screw the bumper into the center and fasten common shade pulls into opposite sides of the knob. Paint the bumper solid black except for the features. Color the large mouth and base red, and paint white around the iris of the eyes. Glue a bit of red and white cloth around the head for a bandanna.



This Saucy Bird Dispenses Twine

PERCHED outside his house, this saucy bird holds twine in his beak ready for your use. A can hidden behind the house front contains the ball of string. For a full-color photo of the dispenser, see page 160.

First make the front, leaving the roof uncut, and glue in place the overhang and roof pieces, securing them with nails. Then band-saw the roof line to shape. Curve the bottom to fit the can. Turn the bird's body and head in a lathe and make flats with a sanding disk, as indicated, for attaching the parts at perky angles. Make feet and perch in one piece. Bore holes for the legs and fill with plastic composition wood afterward, if necessary.

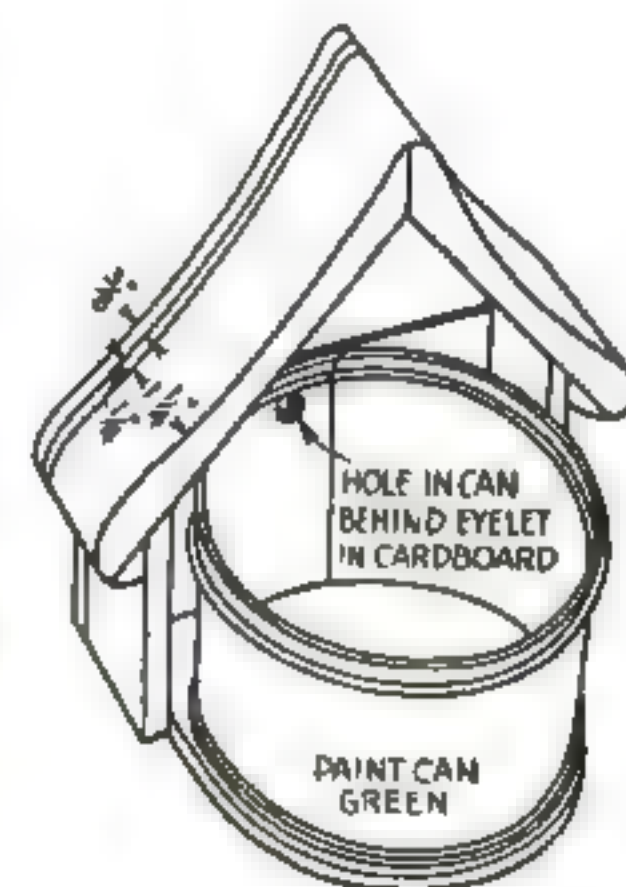
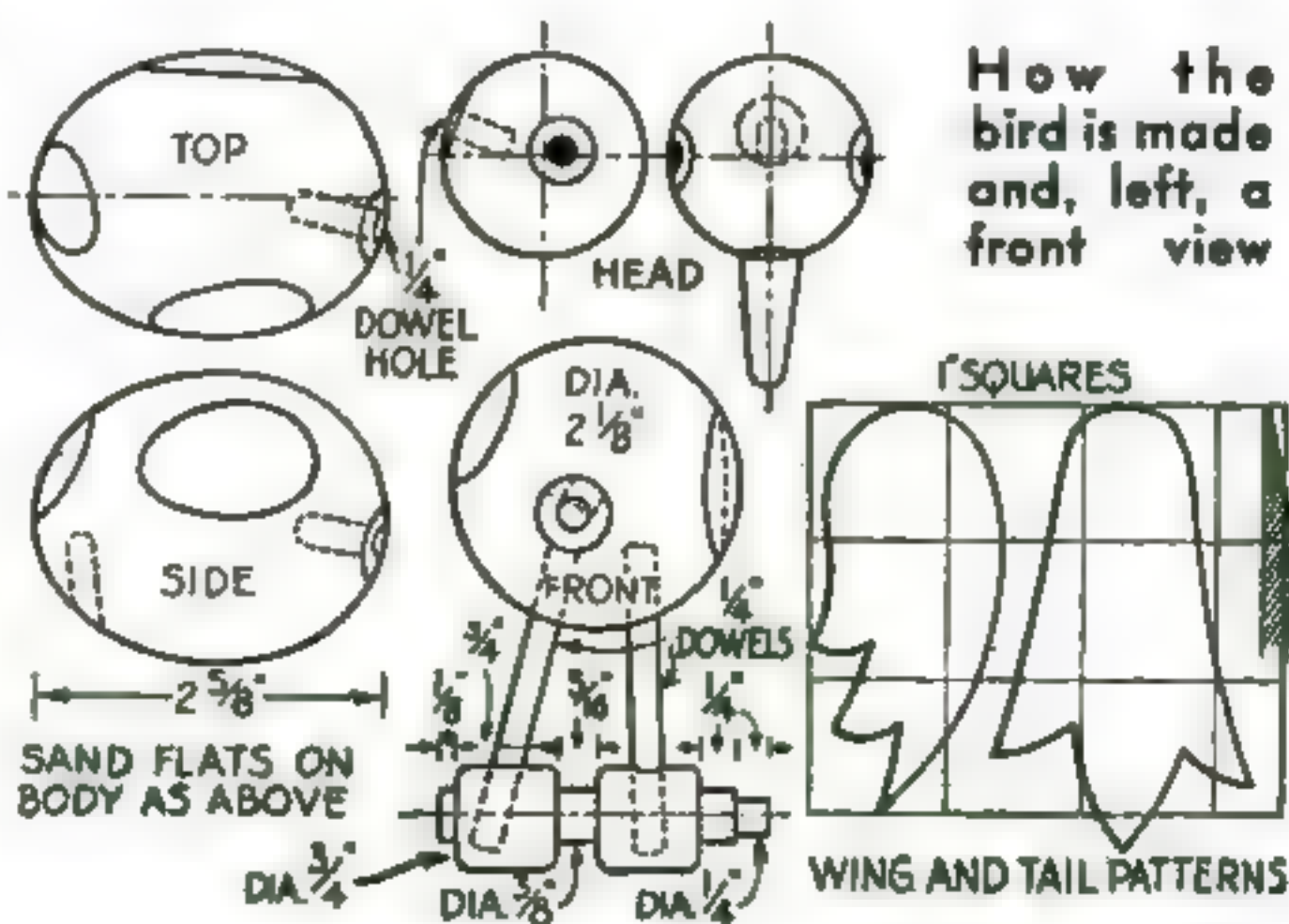
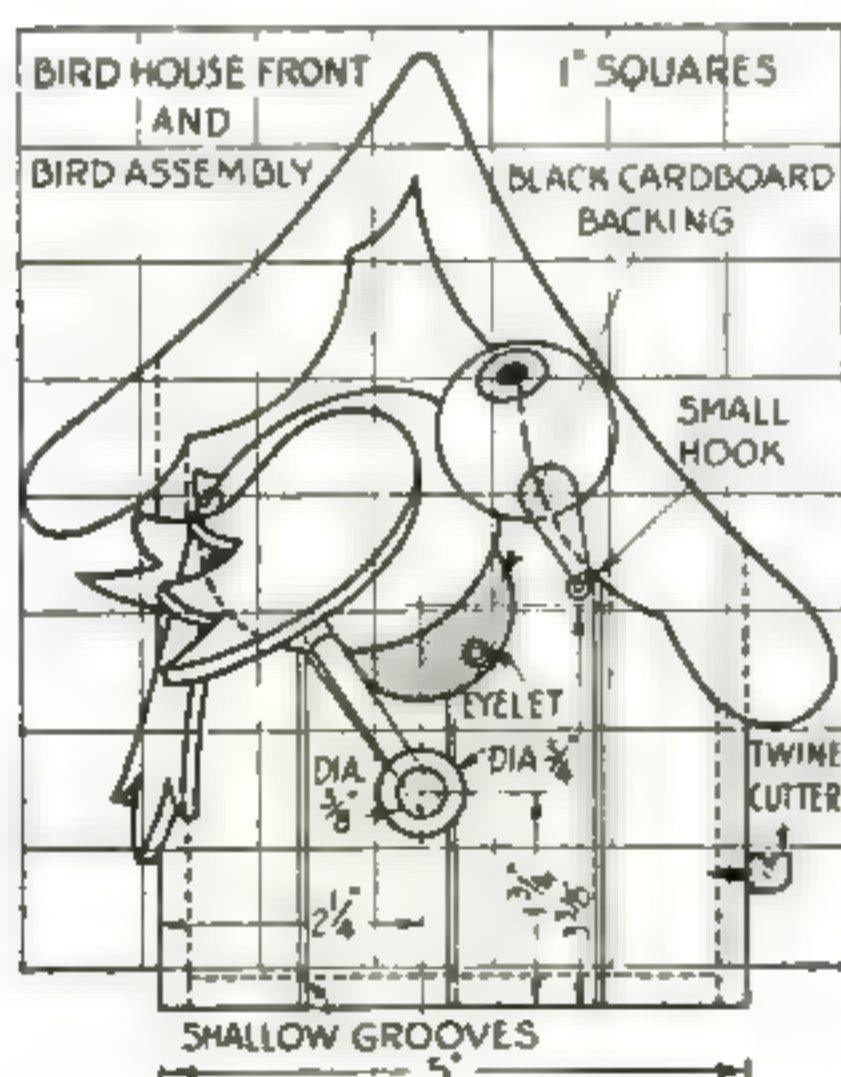
Paint the roof, wings, tail, beak, legs, and eye, yellow; house and perch, green; body and head, lavender; center of eye, black.

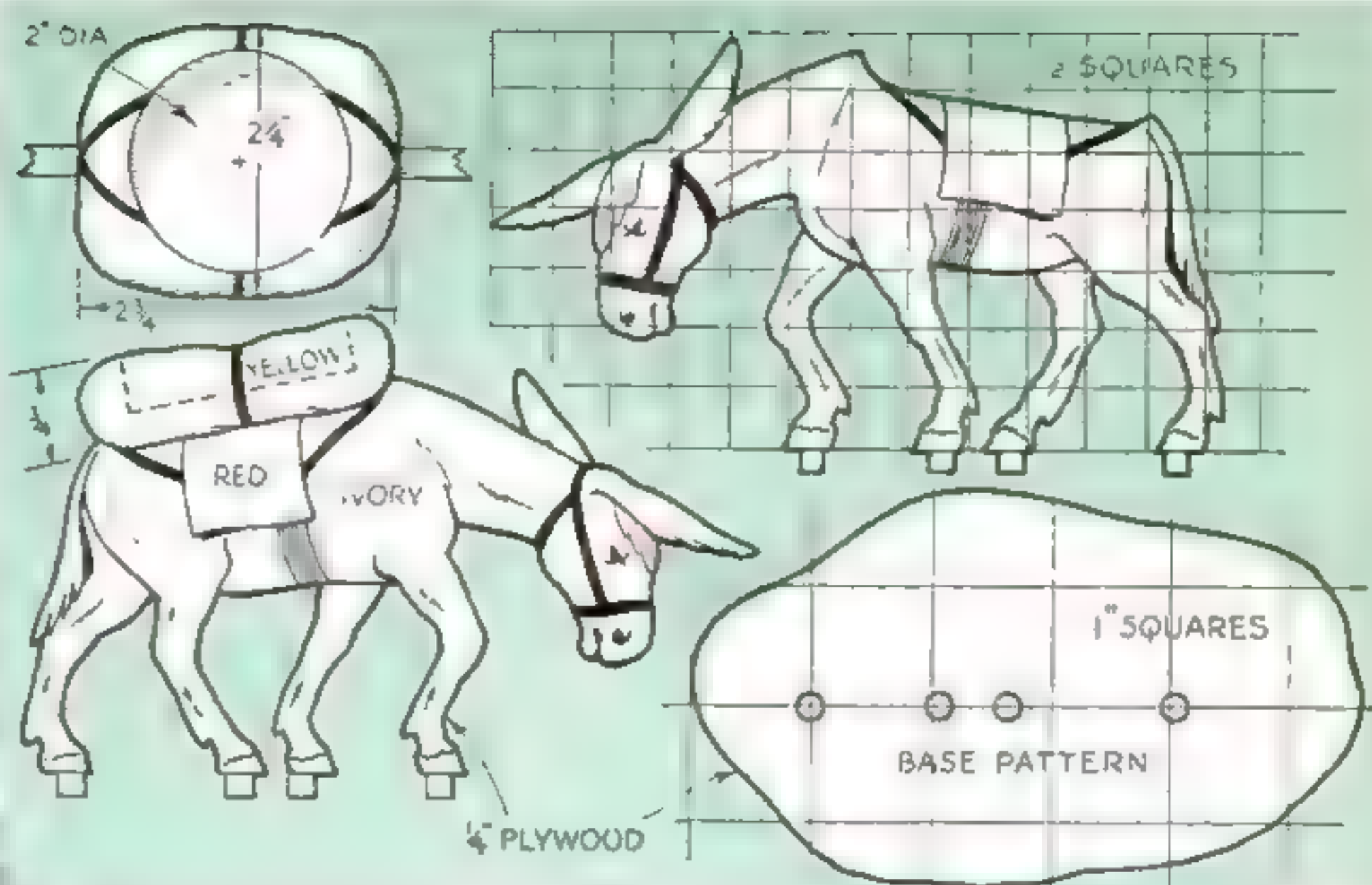
Add cardboard backing, glue perch in place, put a screw into the bird from inside the house, and attach the can. The house can be screwed to the top of a shelf or it may be fastened to a bracket of its own. Thread the string through the cardboard eyelet and the small beak hook.

You can simplify the construction if you wish, by merely making a plywood cut-out of the bird.—**L. M. DINLEY.**



Above, twine dispenser mounted on a wall bracket. The ball of cord is in a can behind the bird house





Plodding Burro Packs a Tiny Pot of Cactus on His Back

JIG-SAWED from $\frac{1}{4}$ " plywood, this little burro carries a pack on his back that is hollowed out to hold a tiny flowerpot or a small modern plastic cup cut down in height to suitable proportions. The same pattern may be used on both sides, or the burro may have a right side and a left. Don't forget the hoof tenons, which glue into holes in the

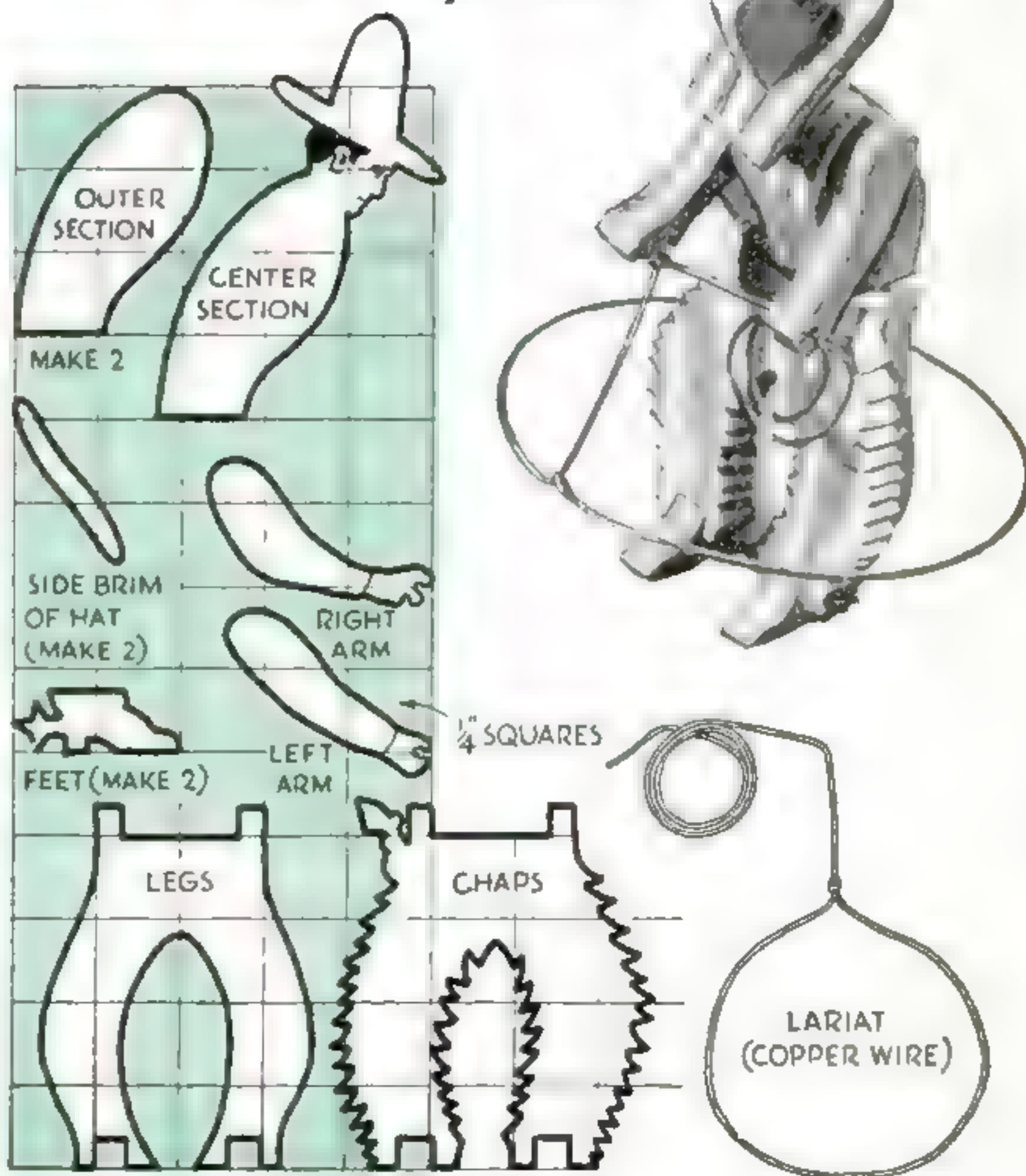
baseboard. Paint the burro with ivory enamel and add the black markings when dry. Dabble the base with streaks of green, red, and yellow, painting over them with enamel while still wet. The saddle is red and the pack, yellow. For a better idea of the coloring, study the natural-color photo on page 160. Choose a small cactus.—LESLIE KINNING.

Roping Cowboy Jig-Sawed from Plywood

HERE is an amusing caricature for rodeo and dude-ranch fans. The parts are sawed from $\frac{1}{4}$ " three-ply wood and require no carving. Put a fine blade in your jig saw, because the turns for the gun, spurs, and chaps are sharp. Use waterproof glue and fine wire brads to hold the sections in place while drying under pressure. Remove the nails later.

First glue the two outer sections of the body and the two that form the sides of the ten-gallon hat to the middle section. When dry, add the arms. The right hand has fingers that hold the wire above the loop; the left hand holds the coil.

Glue the bow legs behind the chaps, and when dry, fasten the body in the slot at the belt. No pressure can be applied or is needed for this joining, or for adding the feet, after the middle joint has set. Before the feet have dried in their slots, stand the figure erect to make sure it balances. Last of all, add the rope and fasten it in the hands with plastic composition wood between the fingers.—EDWARD B. FOX.



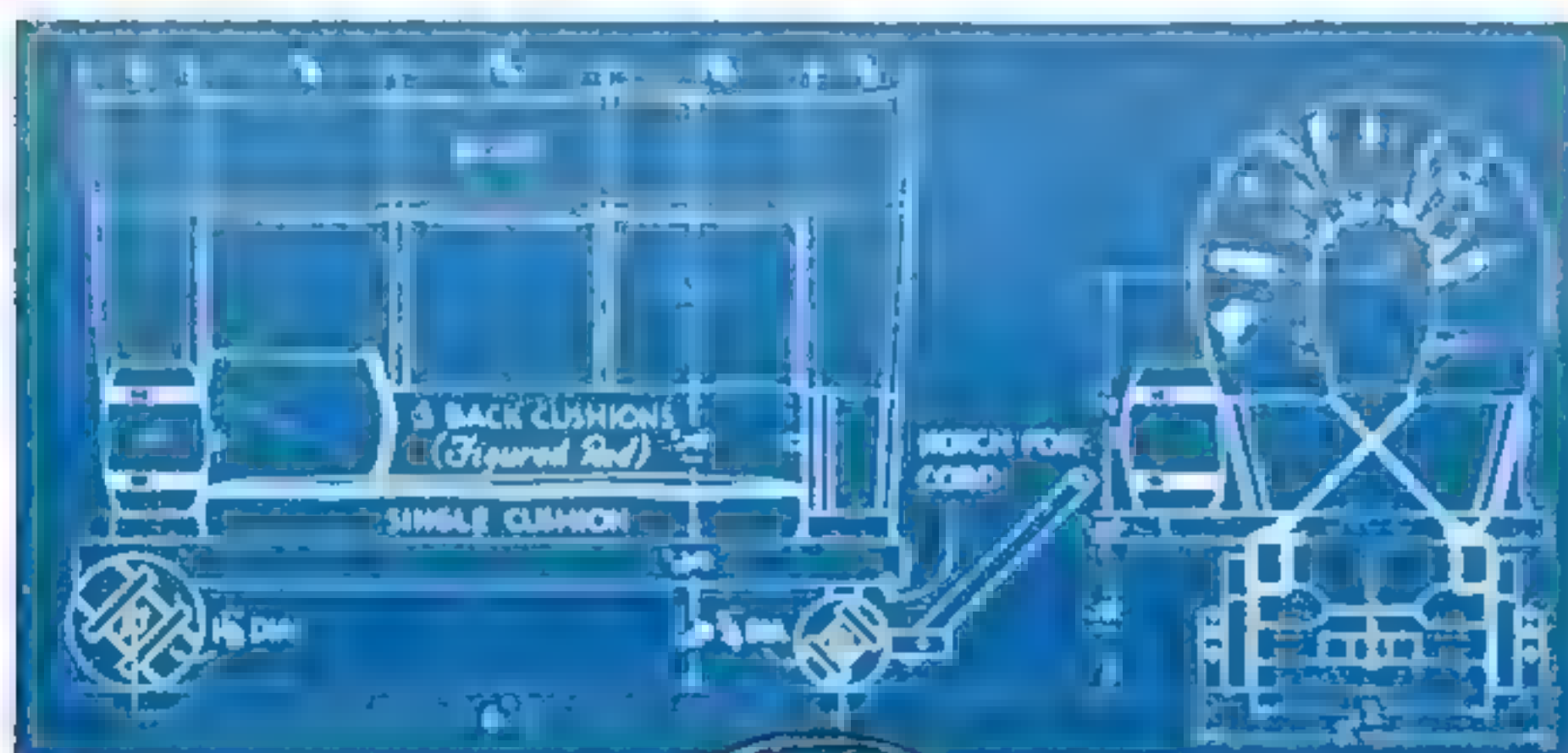
Mexican Patio Furniture for Children's Dolls



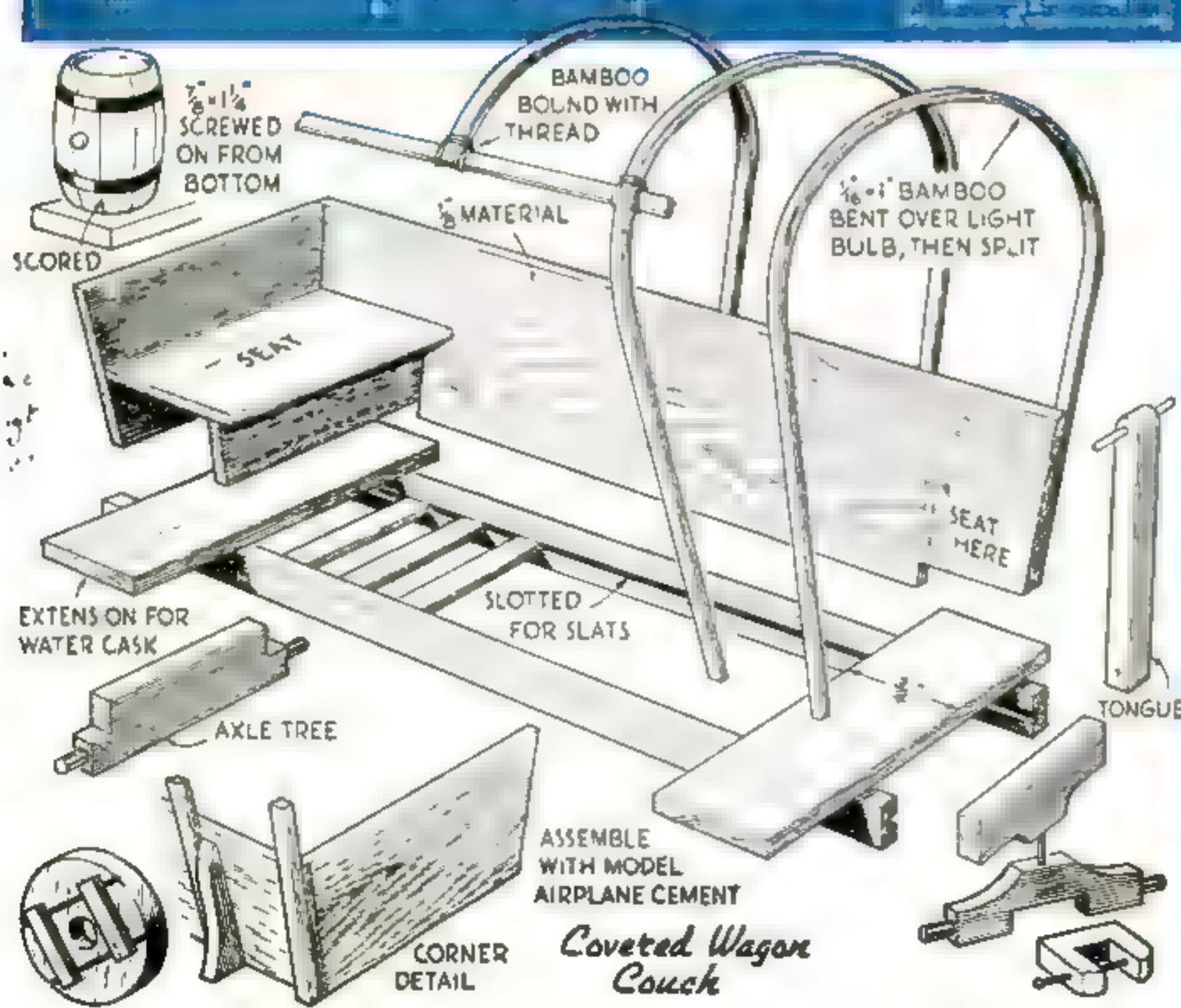
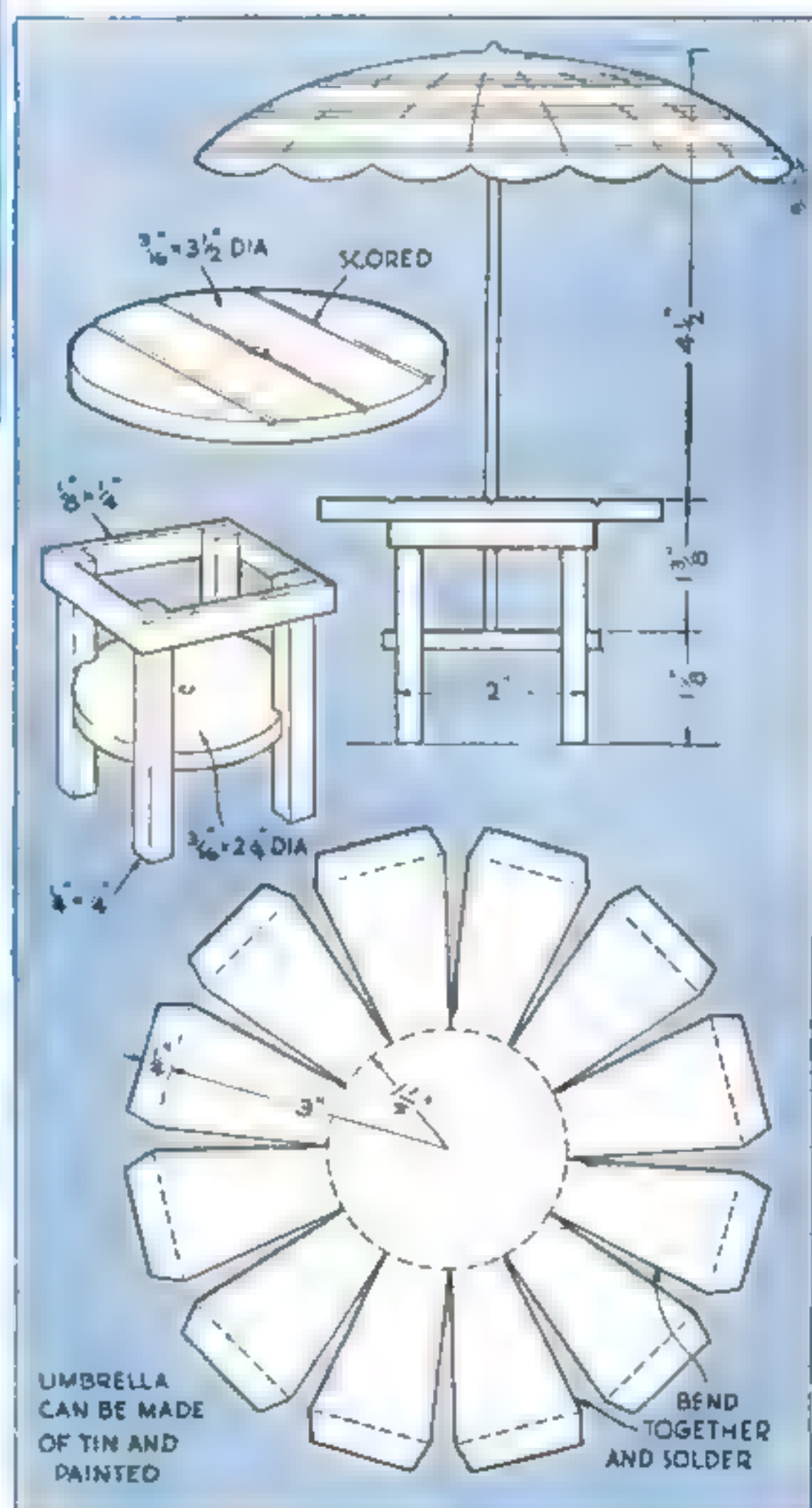
LILLIPUTIAN patio furniture in the popular Mexican motif makes a colorful setting for your daughter's dolls. The accompanying drawings show how a covered-wagon couch, roll-around couch, umbrella table, and garden cart are constructed. Model airplane cement is used to hold the parts together.

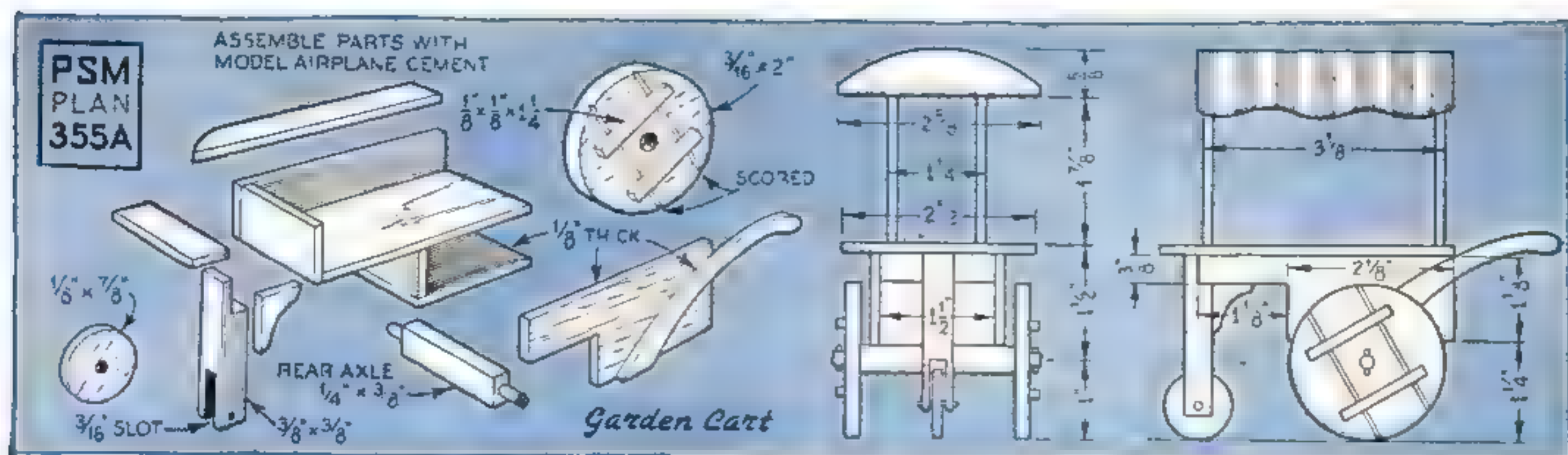
In building the covered wagon, make the axles loose enough so they will not stick after they are painted. The back is a single piece of $\frac{1}{8}$ " material. To bend the bamboo, hold it over a lighted electric bulb, then split and locate the bows as shown. The wheels are single pieces, scored to represent joints, with cleats cemented on. Turn the water cask on a lathe and screw to one of the cross members. The original was painted with white brushing lacquer and the cask embellished with red hoops. Bright red-figured cushions and a blue top completed the wagon, but any color scheme may be used. Soft cotton cord is used for "pucker strings" at the ends of the canopy.

Construction of the other three pieces is simple. Use colored cord to match the cushions on the roll-around couch. Make the umbrella from tin because a cloth umbrella is a



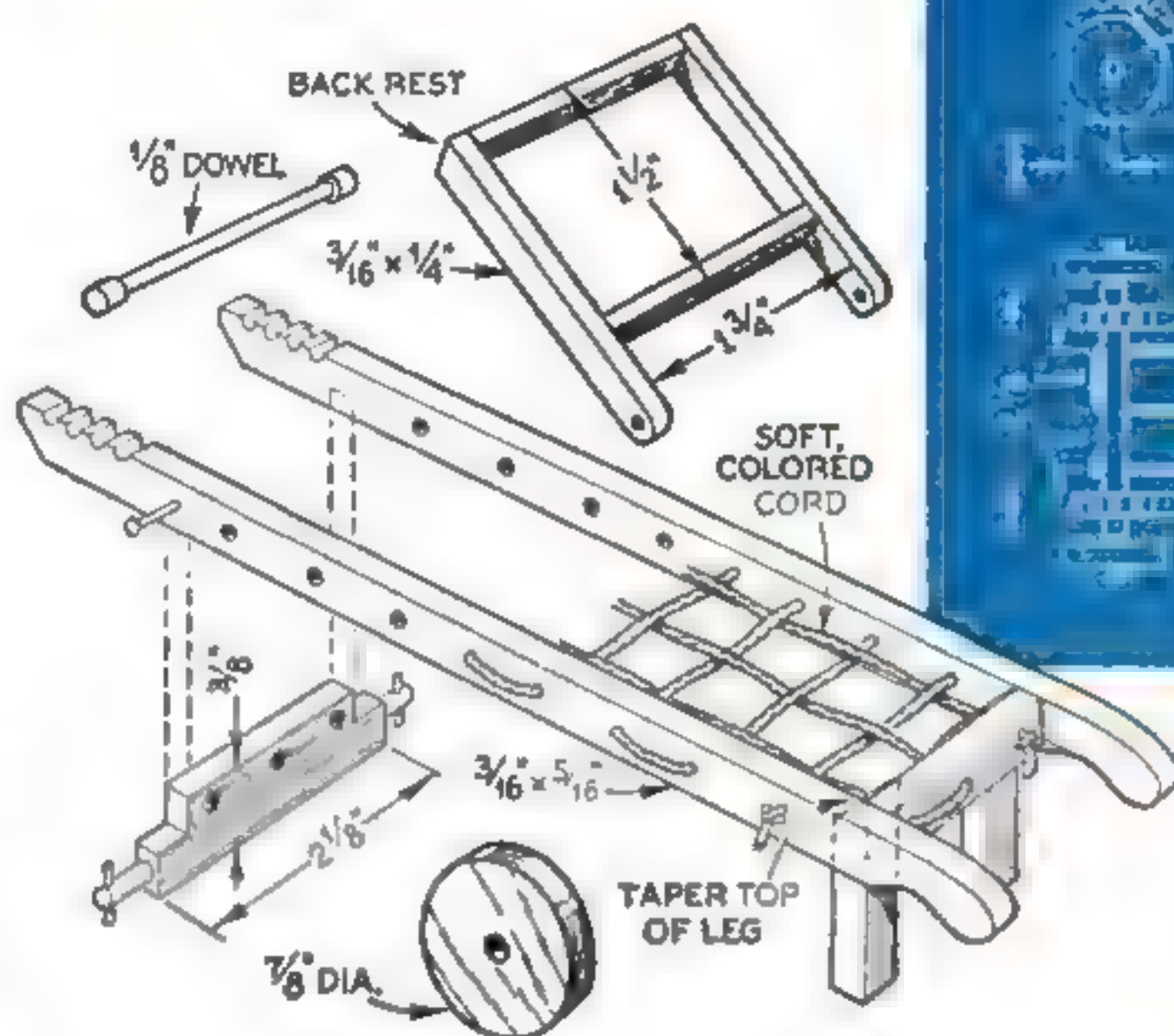
How to construct the unique rolling couch and the garden table with its umbrella. See page 161 for a photo





job for a needleworker and must be stiffened with buckram. The awning of the cart may be cloth or tin. A delicate Mexican flower-and-vine decoration, as shown in the photograph on page 161, may be added.

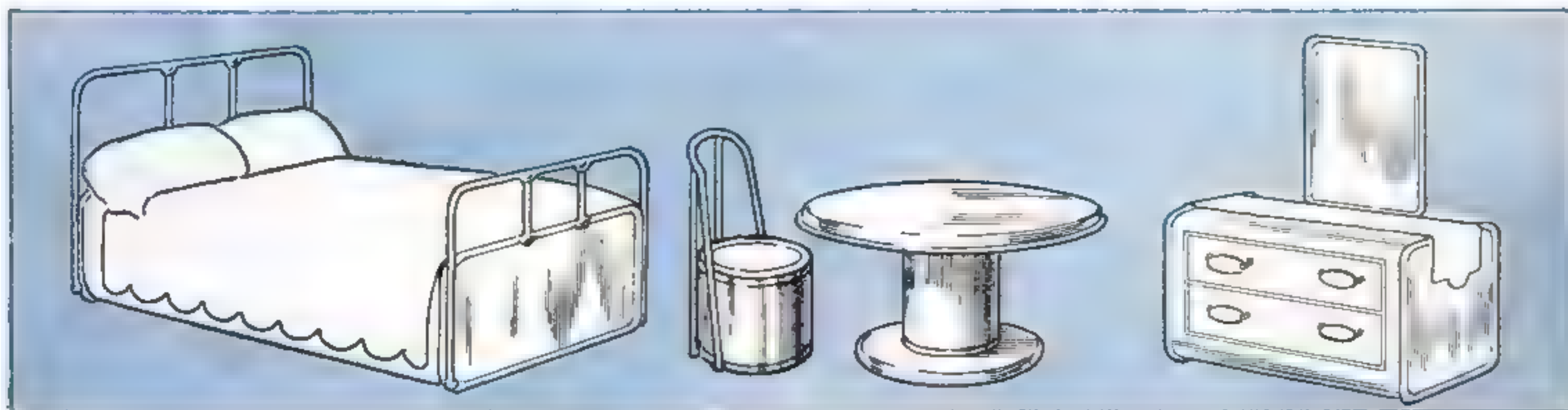
The same drawings may be used as a basis for full-size garden furniture. In that case, let 1" equal 1' and use 2" by 3" pine for framing. Top bows of the covered wagon should be of spruce or hickory. Rope 1/2" in diameter is needed for the roll-around couch. Screws and waterproof casein glue should be used.—LOWELL R. BROWNE.



Drawings of the cart and a simpler type of garden lounge. All four pieces are scale models and can be constructed full size, if desired, for garden use

Tin Cans Turned into Toy Furniture

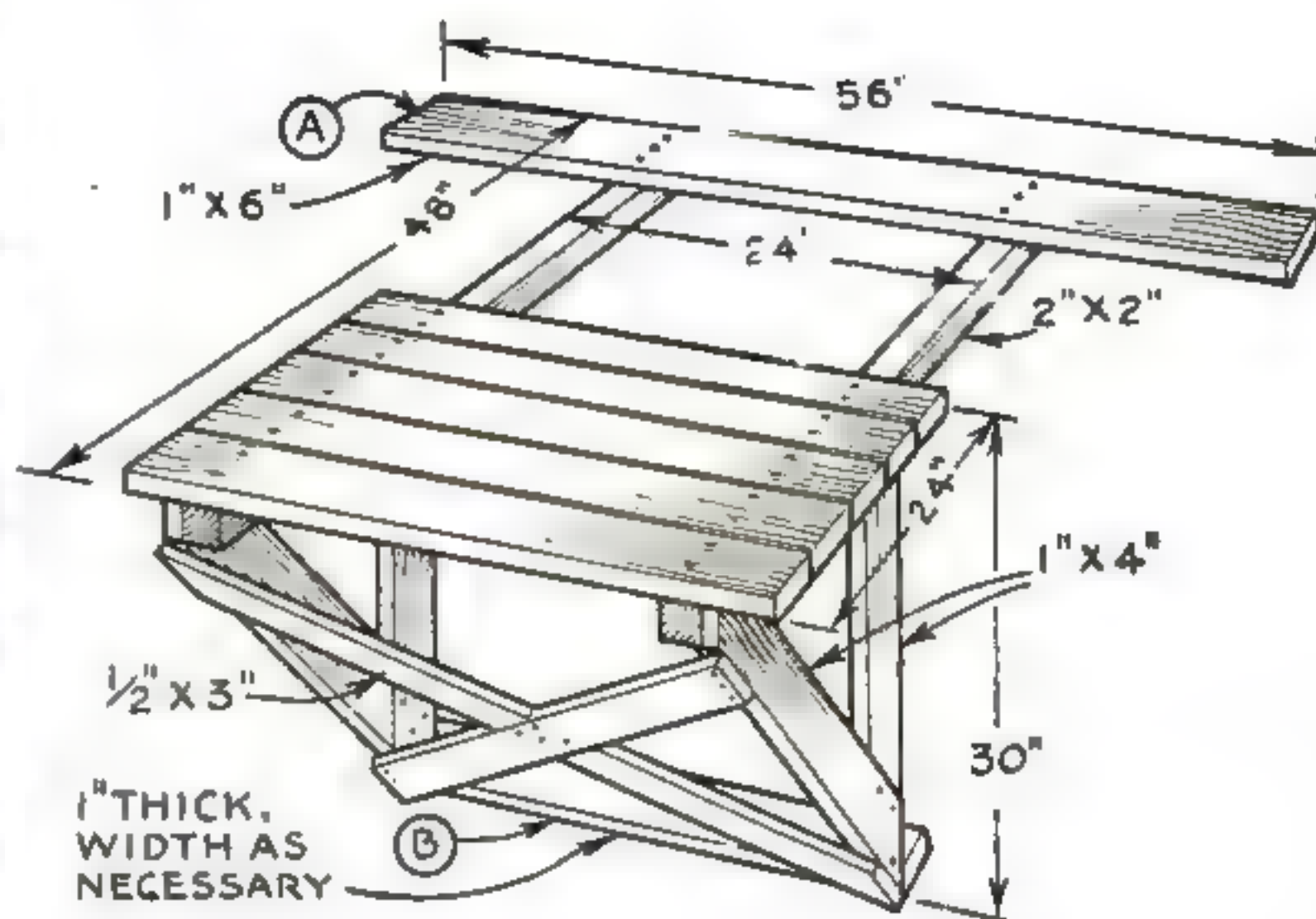
WITH the aid of solder and a few pieces of heavy wire, you can transform empty tin cans into toy furniture that will please any little girl. One half-pound and two one-pound cocoa cans are needed for the bedroom suite. The dresser is the smaller can with the bottom cut from a large can soldered in place for a mirror. Reinforce the joint in back with a loop of stiff wire. Fasten four beads to the front of the dresser to represent drawer pulls by running fine wire through holes punched with a nail. The chairs are small condensed milk cans with backs built of wire. The table is the lid of a gallon syrup pail, a slender can, and a medium-sized lid.—HAZEL F. SHOWALTER.



Platform for Painting and Repairing Windows



Make the crosspiece as long as desired, but the platform must be shorter than the narrowest window

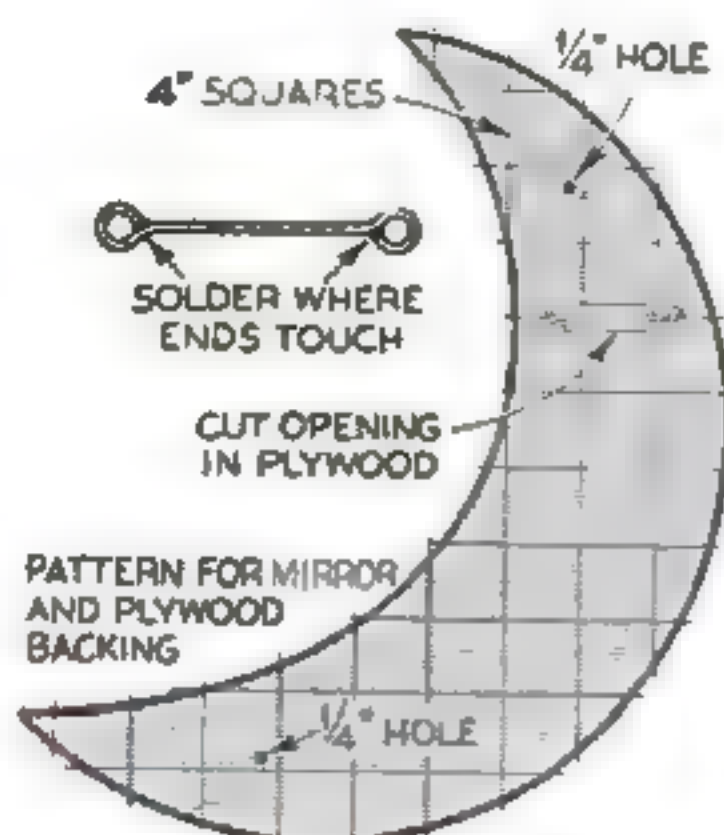


FOR painting, cleaning, or repairing windows at any floor level, a platform of the type illustrated is very handy. If constructed of No. 2 pine, the material specified in the drawing is heavy enough to make the platform safe. The 1" by 6" crosspiece marked A rests against the inside wall if the window is single; but if the windows are double or triple, one or both ends will have to be shimmed off by placing blocks between the crosspiece and the inside window trim so the platform will rest level. The piece on the bottom labeled B should be as wide as the distance the sill extends beyond the outer wall so the uprights clear the sill.—E.R.

Moon Mirror Decorates Odd-Shaped Wall Space

THIS moon-shaped mirror is designed for an unsymmetrical wall space that nothing else seems to fit. Sketch the design full size on cardboard, mark the two $\frac{1}{4}$ " holes, and take the pattern to a glazier. Don't have the edge beveled—merely cut and ground smooth. Purchase at this time the two rosettes needed for mounting the mirror.

Saw the mirror back from fairly thick plywood, and cut out the space indicated, across which the wire hanger is fastened. Stain the edge of the plywood dark. Drill the plywood to match the mirror, and mount the mirror with a piece of heavy brown paper between to protect the silvering. Hang the mirror with a small hook so that it will lie flush against the wall. Put a small headless finishing nail in the wall to help support the bottom.—H.D.





• CAN YOU BEAT THESE Goofy Birds?

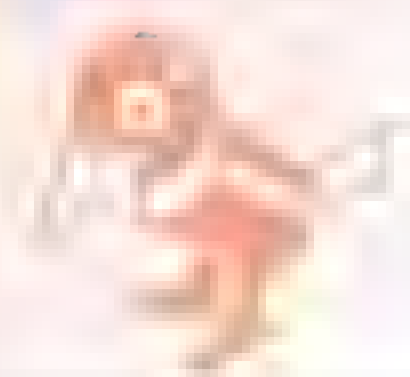
YOU can have a lot of fun making goofy birds from odds and ends of materials picked up about the house. Just try it. If you hit upon something that is particularly amusing, send it in to us or submit one or two good, clear photos of it. To encourage a little friendly competition, we will award eight prizes totaling \$50 for the best goofy birds as follows:

FIRST PRIZE.....	\$25
SECOND PRIZE	15
THIRD PRIZE	5
FIVE PRIZES, \$1 EACH	5

Use any materials you please, provided they are of a common, familiar type and cost little or nothing. The idea is to see how much imagination you can display in selecting the materials and combining them to look like a comical bird. Craftsmanship is of secondary importance.

For example, Miss Hazel F.

IF
YOU CAN,
HERE'S A
CHANCE
TO WIN A
CASH
PRIZE
IN
OUR NEW
NOVELTY
CONTEST

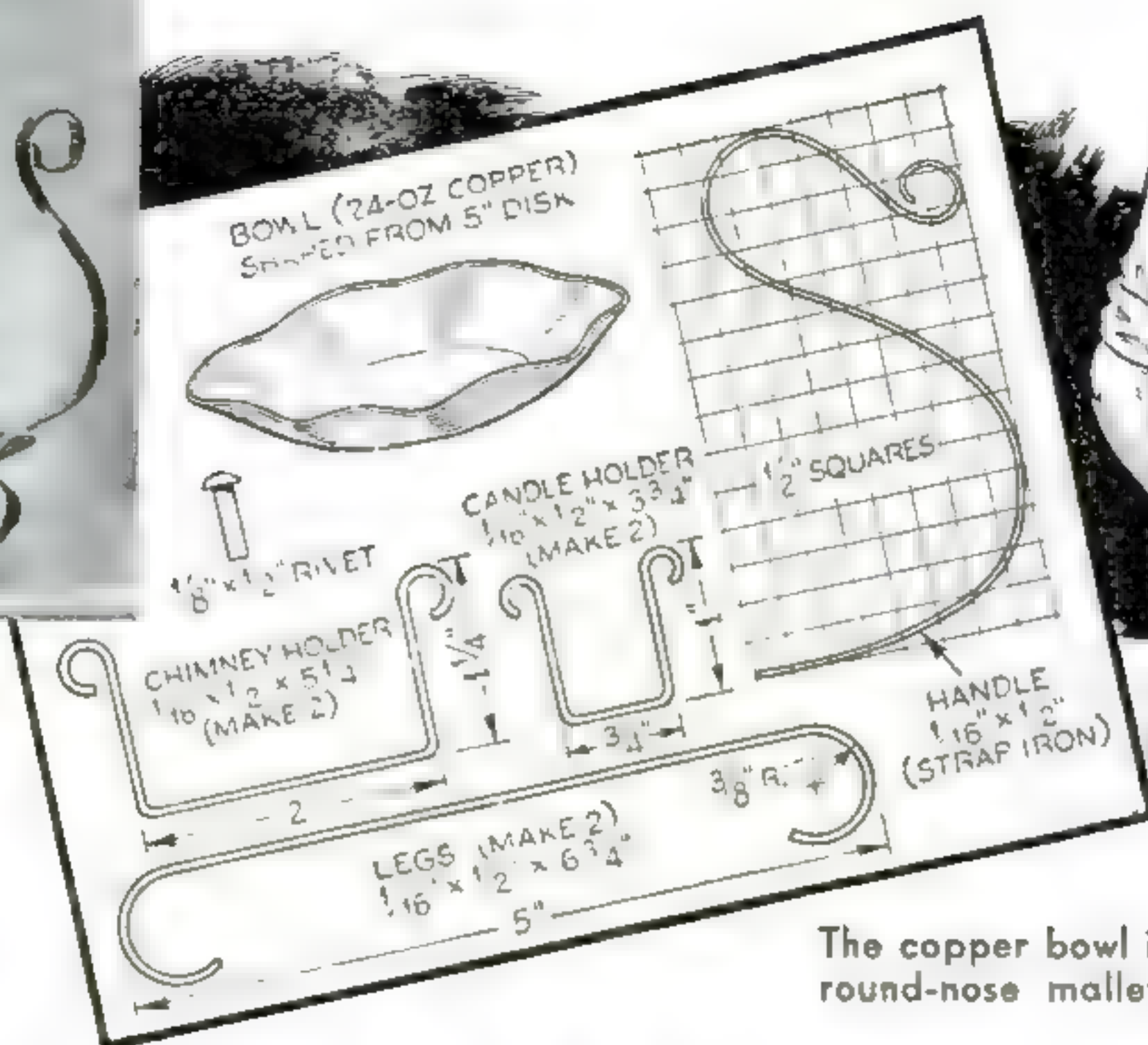


Showalter, who has designed so many unique craftwork novelties for POPULAR SCIENCE MONTHLY, chose clothespins and spools as the main materials for the goofy birds illustrated above, and also used some wire, plastic composition wood, scraps of thin wood, and wooden beads. For your contest entry, of course, you will do better to find other materials, but this shows what can be done.

Remember, only one entry from each contestant. Size does not count, so if you are going to ship the model itself to us, keep it small. If you intend merely to submit photos of the model, it can be any size you please. Mail your entry, fully prepaid, to the Contest Editor, POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York, to arrive on or before January 2, 1939. No entries will be returned. The judges will be the editors of this magazine, whose decision will be final. In case of ties, each tying contestant will be awarded the prize tied for. The contest is open to all except employees of this magazine.



With its polished chimney of thin, clear glass, this candle holder is a quaint and appealing ornament



The copper bowl is hammered to shape with a round-nose mallet. The other parts are iron



Candle Lamp Follows a Colonial Design

REMINISCENT of the days of crinoline, this dainty Colonial candle lamp harmonizes admirably with Colonial-type furniture.

The copper bowl is raised on end-grain wood or a lead cake by light blows with a round-nose mallet in ever-diminishing circles from rim to center. Crimp or wave the edges as illustrated. Drill a $\frac{1}{8}$ " hole in the center and two holes near the edge for the handle rivets. Cut strap iron for the candle holder, chimney holder, and legs and file the ends square. Drill

a $\frac{1}{8}$ " hole in the center of each. Bend the parts to shape with round-nose pliers over a pattern of the scrolls drawn full size on paper. Clean the ironwork with emery cloth, heat it over a gas flame, and plunge it into water to color it the desired tone. Furniture wax or lacquer will preserve the finish.

Rivet the assembly together and the handle to the bowl. The chimney may be purchased at most local hardware stores, which still stock these relics.—ROBERT C. HENLEY.

Apartment Clothes Closet Holds Complete Shop

BY AN ingenious arrangement of tools, Jerome Frankel has converted a clothes closet in his New York City apartment into a remarkably complete home workshop without materially reducing the capacity of the closet to store clothes.

Inside the door is a tool cabinet, above which is a shaded light that illuminates the work being done on a folding workbench just below the cabinet. This bench turns down against the door when not in use. A large hook holds the closet door in the open position. Just inside the door is another storage cabinet, and large tools such as saws are fastened to the wall next to this cabinet.

The power tools are mounted on a narrow bench. When ready for use, special legs lift the bench off its casters to give steadiness. A single motor is mounted on a subframe in such a way that it can be slid along and locked in place under the tool it is to drive.



Linoleum Inlays for Craftwork

THE popularity of linoleum inlays for decorating floors, table tops, and other surfaces offers the amateur craftsman a new and colorful field in which to work. The inlaid designs, in this case, are made up of disks of linoleum set into circular holes in linoleum of a suitable background color.

Since the background piece is ordinarily of moderate size, it can be taken into the shop and the holes made with an auger bit in a brace or a drill press. Use a wood-boring bit with two cutting lips, which will produce a clean hole. Bits of this type, if intended for drill-press use, are known as machine spur bits.

For forming the disks, a punch is used. Perhaps you can find at a hardware store or in a mail-order catalogue some hollow-drive saddler's punches large enough to cut the disks. If you have a lathe, you can make suitable punches from drill stock or other steel that will hold an edge; or you can have one made at nominal cost.

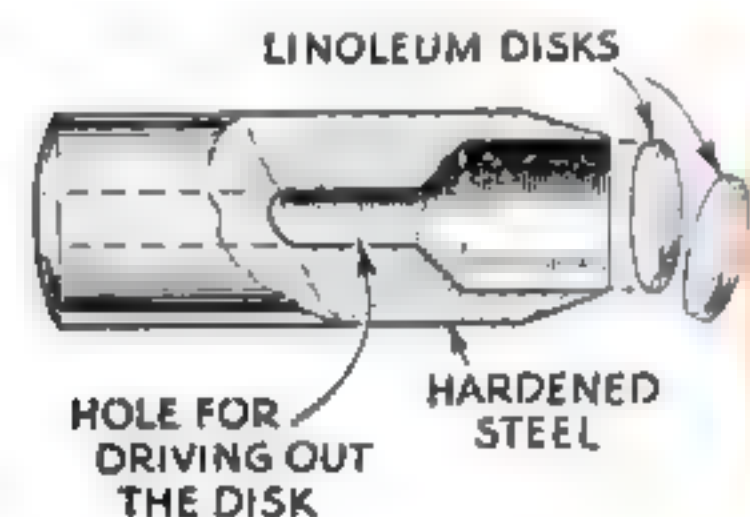
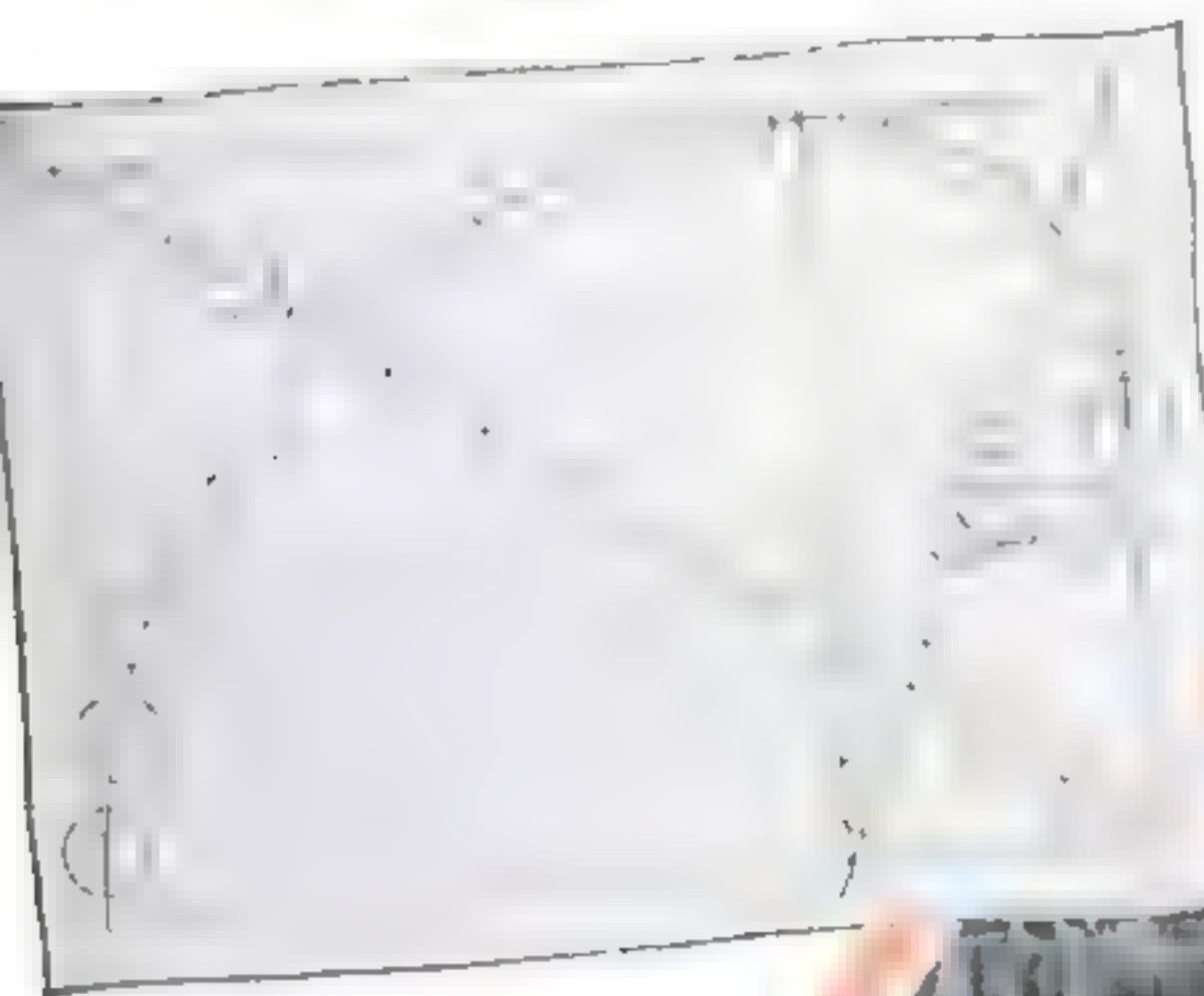
Push or hammer the disks into the holes,



Modernistic table with an inlaid linoleum top

and cement the design in place with waterproof casein glue or standard linoleum paste. Weight it down well until the cement has set firmly.—VERNON B. CASE.

Left, the layout for a rhythmic design. The disks are also used to outline animals, birds, fish, and various figures



Homemade punch. The hole through it is for pushing out the disk with a rod or blowing it with compressed air



Making the holes with a wood-boring or machine spur bit. An auger bit in a brace will serve as well. Left, forcing disk from punch, which should be hardened if much work is done

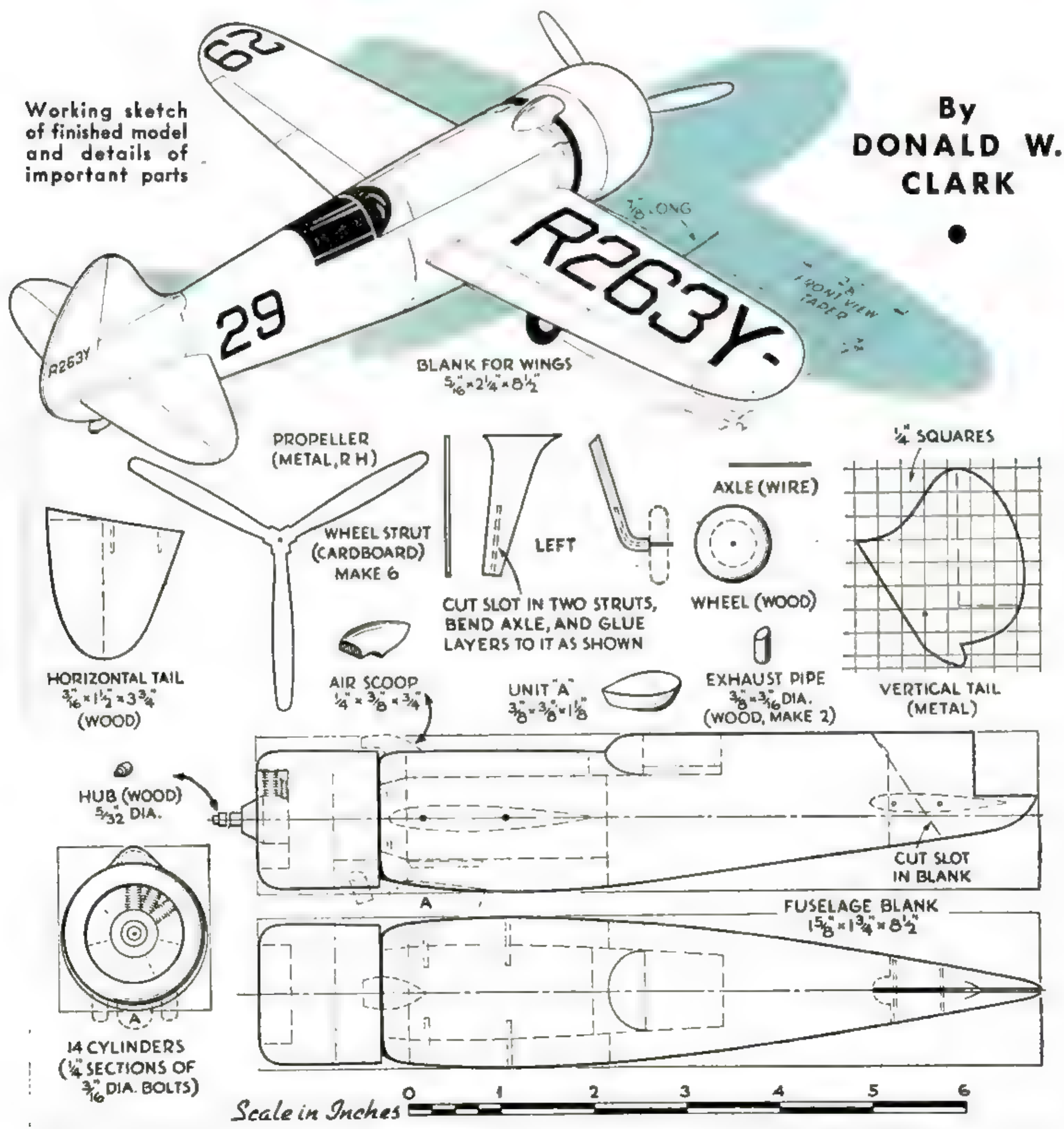
Model of Roscoe Turner's

OF ALL the great racing airplanes of the world, the one that is now most popular is Colonel Roscoe Turner's silver-colored *Meteor*. It has an unusual appeal for model makers because of its record-breaking performances and its trim, beautiful lines—the last word in bullet-like efficiency.

Our model is built as usual to the scale of $\frac{3}{8}$ " equals 1' of the original plane. Only

twenty parts are required to construct it, not including the engine. The extra deep recess in the cowl unit for the engine can be cut in by drilling a ring of holes to the proper depth and digging the wood out with a knife or small chisel. However, if a lathe is at hand, it will be much quicker to turn this part and glue it to the fuselage. To represent the twin-row cylinders, cut short pieces of bolts and set them in place with cement. The inner

By
DONALD W. CLARK



Racing Plane "Meteor"



set should be cut in half and placed first. A pair of tweezers and a tiny screw driver will be useful for this job.

Cut each wing 4" long and taper the leading edge $\frac{1}{4}$ " and the trailing edge $\frac{1}{2}$ ". Plane the wing so it tapers for $2\frac{1}{8}$ " until only $\frac{3}{16}$ " thick at the tip, and shape the tip as shown. Attach it with pins. The dihedral or upward slant of the wings is $\frac{1}{2}$ "; the total wing span $9\frac{3}{8}$ ".

Build up the wheel struts from three plies of cardboard. Bend the axle and shape the strut to it with glue. Sandpaper all parts thoroughly.

Paint the entire plane silver and use black for windows, cowl recess, tires, numbers, and details. If all details and numbers are marked with a hard pencil on the wood, they will show through the silver paint sufficiently to serve as a guide in applying the black paint.

Painting the black numbers and details. Left above, the model from the front. Below, the shaped parts



Turner Breaks Record in His Speedy Ship

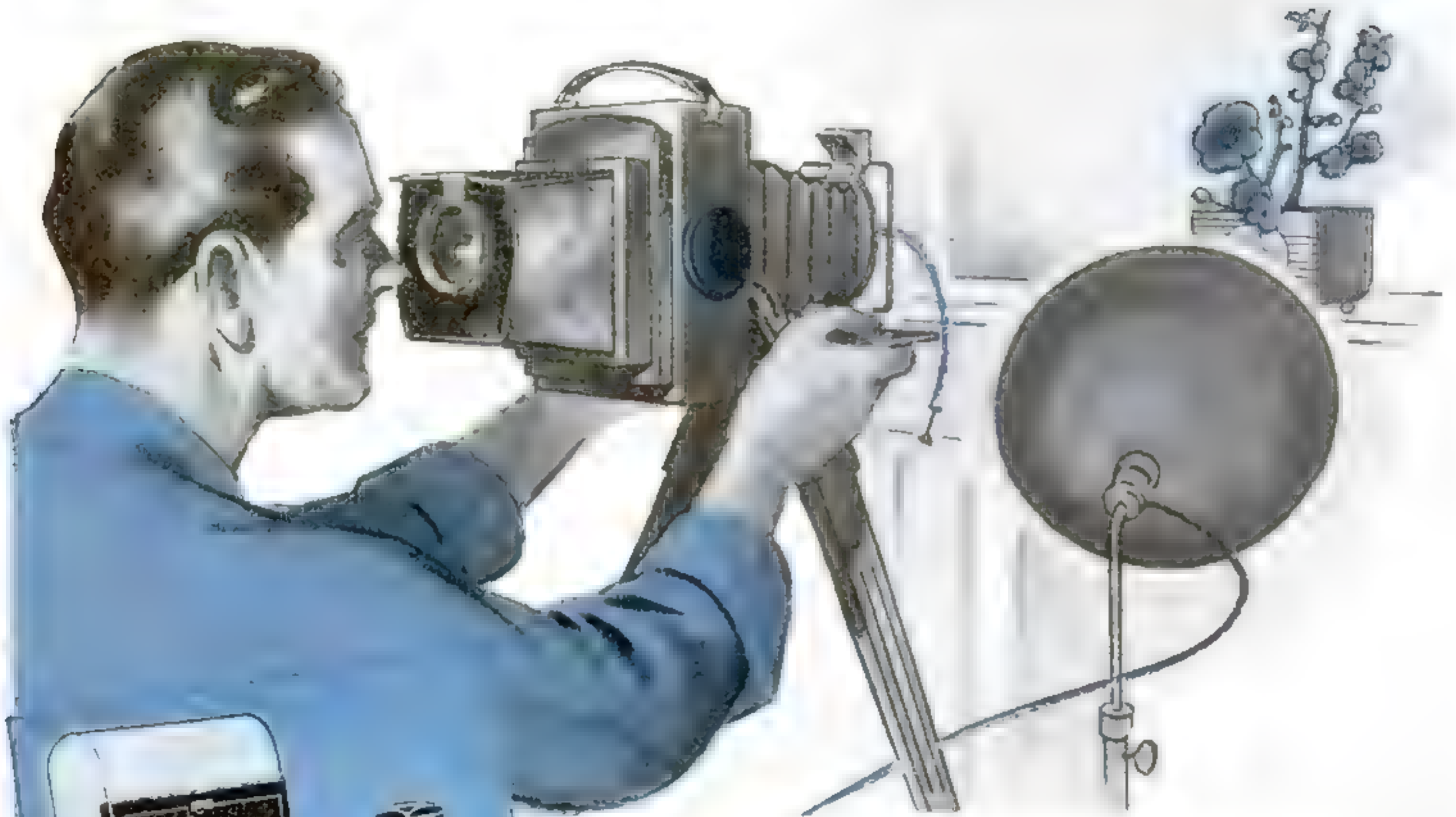


FLYING his special Turner-Laird racer, Colonel Turner lapped the entire field to win the Thompson Trophy in the recent National Air Races at Cleveland. He set a new record of 283.419 miles an hour for the 300-mile race, breaking the record of 264.261 set by Michel Detroyat of France in 1936. His total winnings for the race were \$22,000.

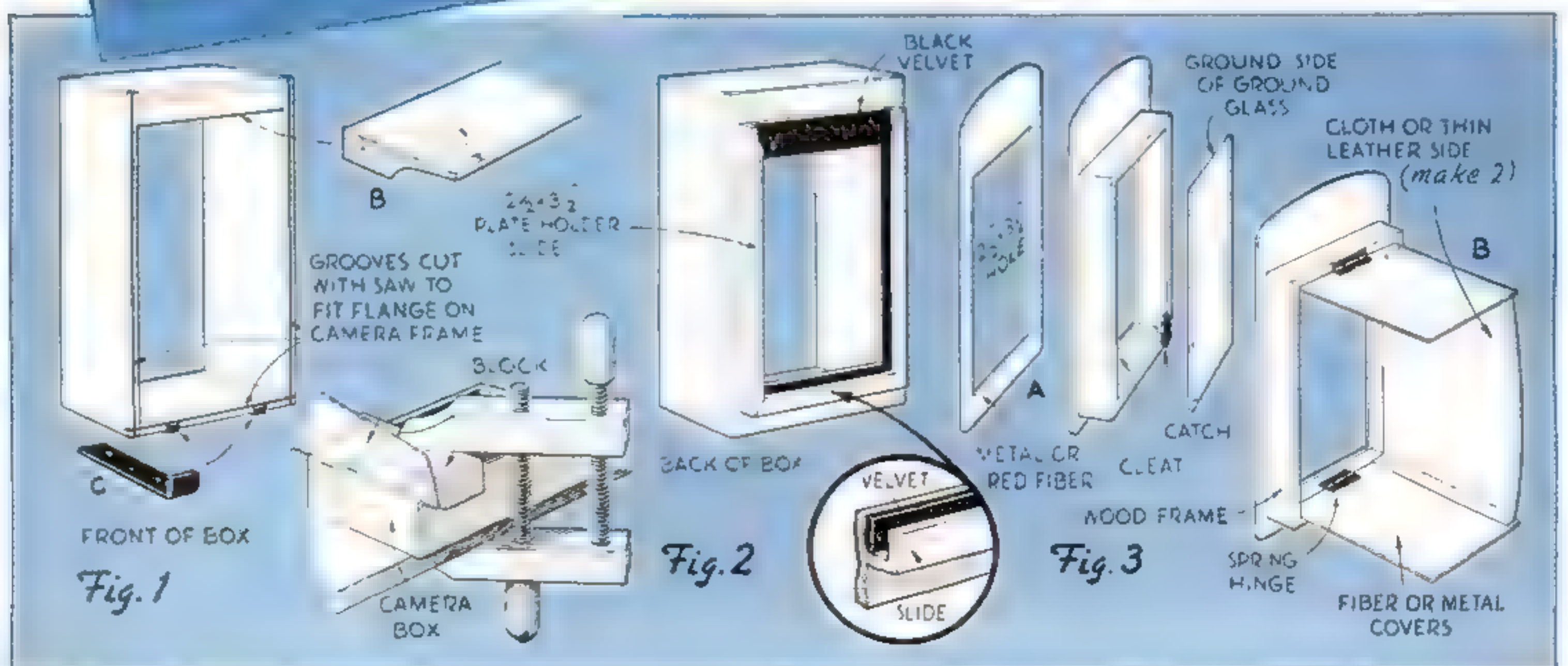
The span of the plane is only 25', length 24', height 9' 6". It is powered by a 1,000-h. p., 14-cylinder twin-row Wasp engine. As used in the last Thompson race, the plane had wheel pants.

Cut-Film Adapter

By CHARLES R. EMERY



FOLDING roll-film cameras, provided they have a removable back, can be converted into cut-film or plate cameras by making an adapter like that shown. In this case the camera used was an old-style one of a very widely distributed and popular type generally referred to as a "folding brownie." Of course, the dimensions and the method of joining the adapter to the camera will depend upon the model you use, and if you are buying a second-hand camera for the purpose, pick out one that will be comparatively easy to alter.



for Roll-Film Camera

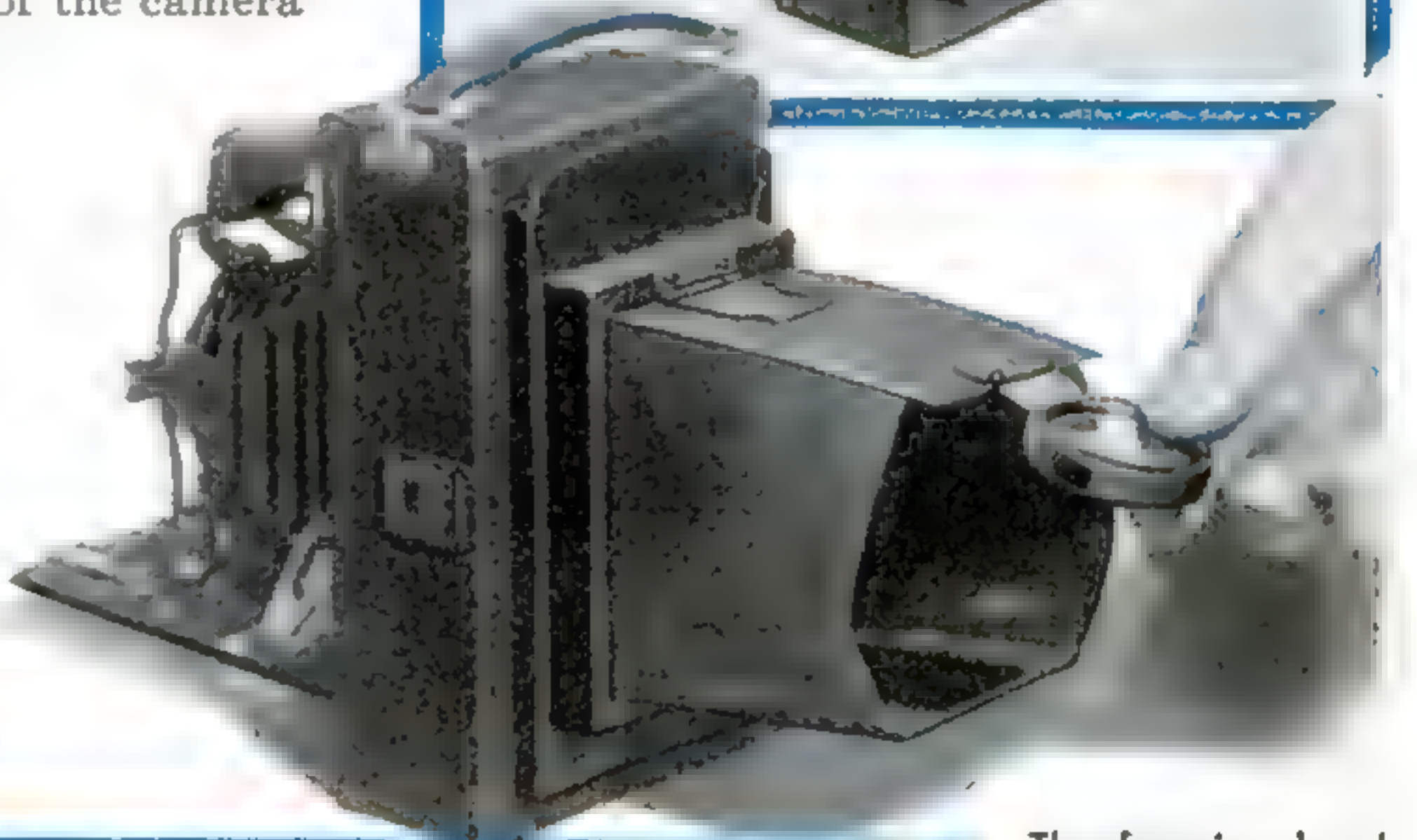


Placing the camera in the adapter box. At right, how the ground-glass focusing attachment slides in place

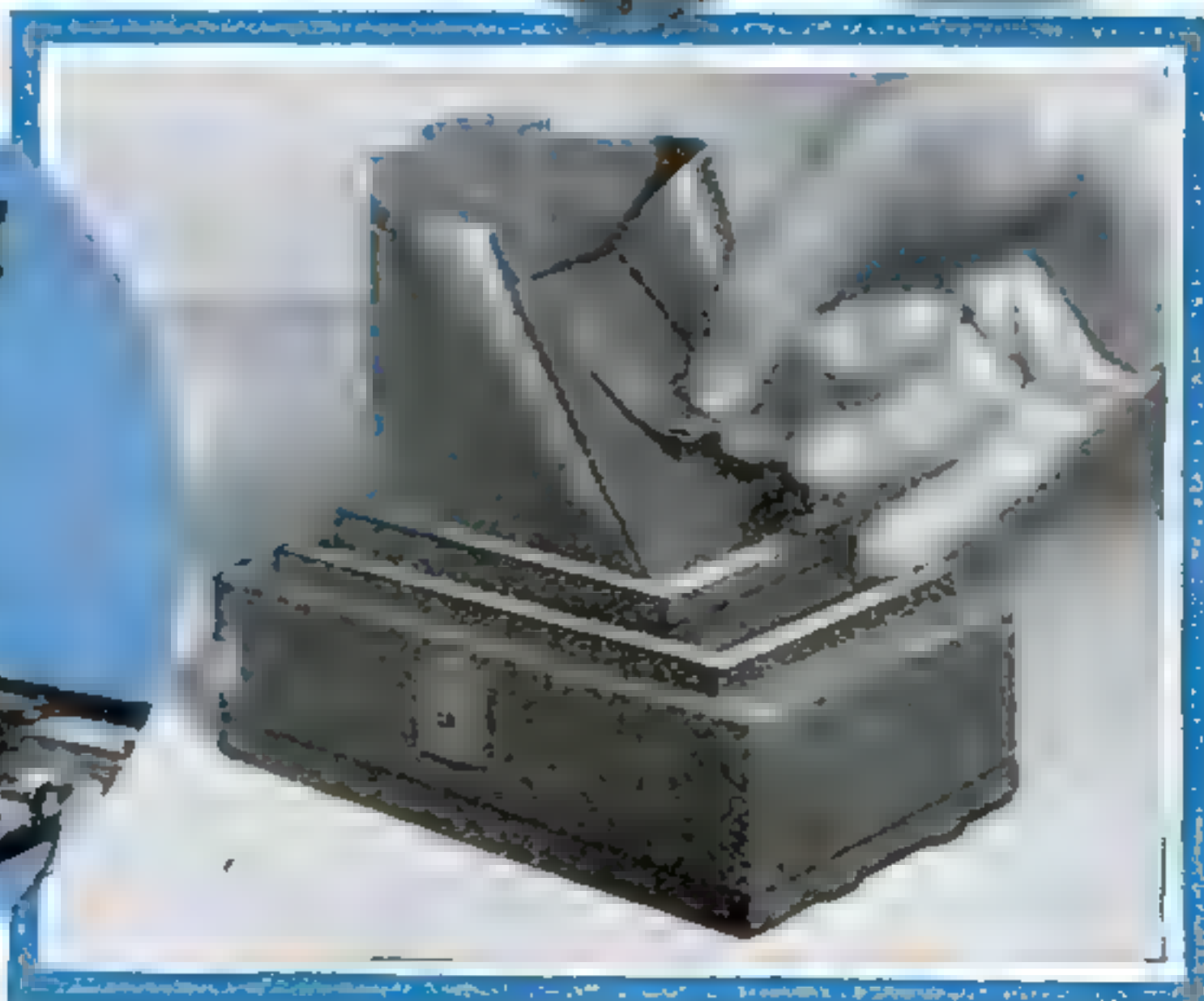


First, remove the back or film box and build a box of thin wood just like it. I used $\frac{1}{4}$ " mahogany fastened with waterproof glue. My camera has a flange on the sides and bottom, so grooves were cut with a saw as shown in Fig. 1. At the top of the camera there are two lip pieces that slip over and under the end piece of the box. To receive this, a tapered piece of wood is glued in as shown at B, Fig. 1. The front of the camera must fit snugly for a light-tight job. Two pieces of brass C, Fig. 1, serve as catches for the sliding lock.

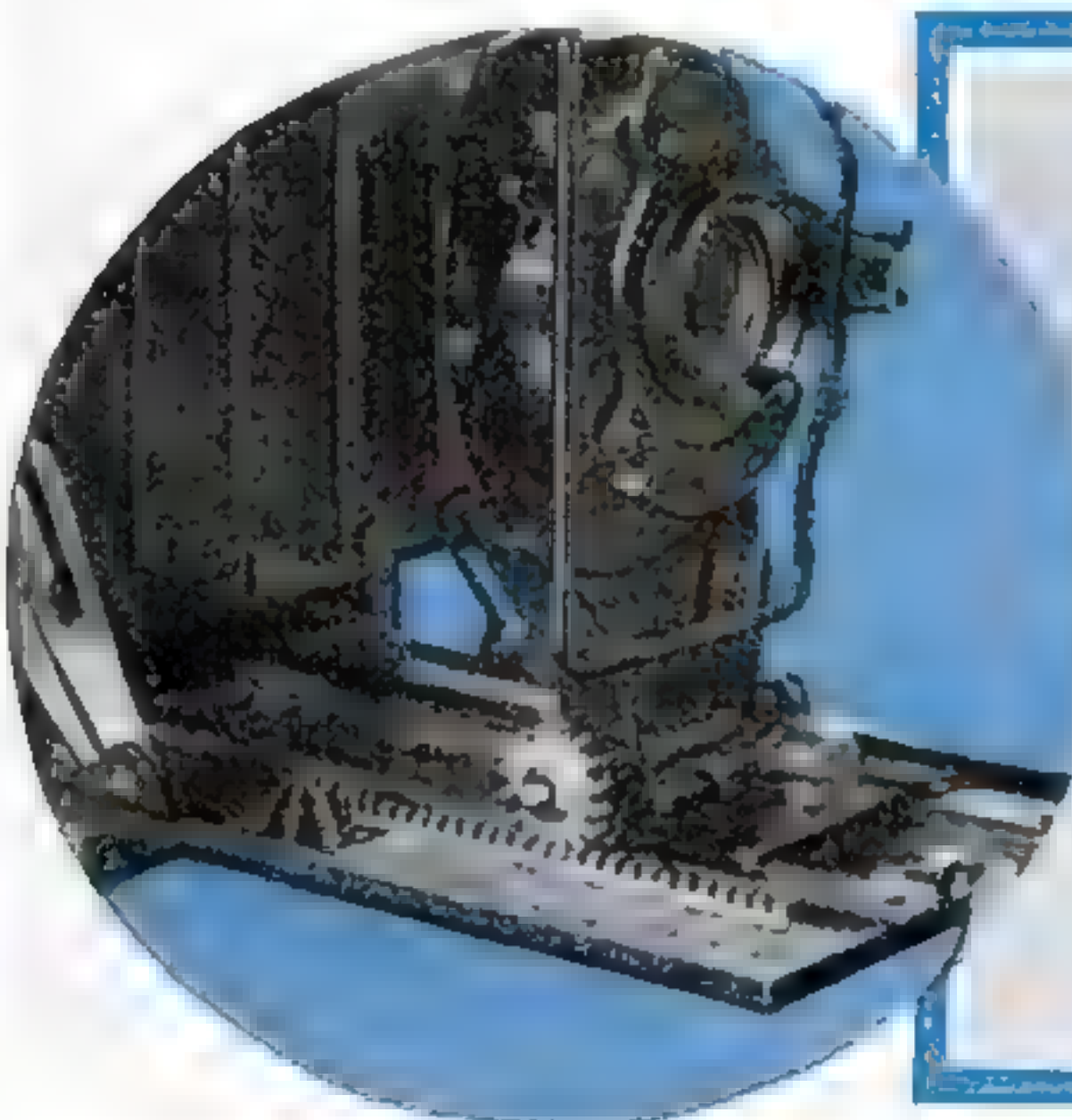
To complete the back of the box you will need thin metal plate holders. The $2\frac{1}{2}$ " by $3\frac{1}{2}$ " are suitable for a camera such as illustrated. Next



The focusing hood when fully open. A small magnifying glass is attached to the top cover so as always to be handy for insuring a very sharp focus



A small strap aids in lifting the bottom cover of the focusing hood. In circle, the rack and pinion added for convenience in accurate focusing



build a slide as shown in Fig. 2 to receive the plate holder. Fill the box corners with composition wood and give the inside two coats of flat black. Cover the outside with thin leather or finish with varnish.

A focusing hood may be made as shown in Fig. 3. From a piece of metal or red fiber, cut a piece to the shape shown at A, Fig. 3. The outside dimensions should be the same as the plate holders. Make a wooden frame about $\frac{1}{2}$ " deep and a little larger inside than the hole in the fiber or metal piece. Note the cleat at the bottom of the frame; this is for the hinge on the bottom cover. The covers B are made of thin metal or fiber. The bottom cover folds inside the frame, while the top cover folds down flush all around. Two small spring hinges are used to hold the hood open when in use. Attach a small catch at the bottom to keep the covers down when not in use. Cement a piece of ground glass in the frame as shown.

The sides of the hood are thin leather or black cloth. Have your camera dealer show a camera of this type and see how these hoods work. Mount a small magnifying glass on the top cover as illustrated in one of the photographs. This comes in handy for sharp focusing. The strap handle shown came from an old camera I found in a camera repair shop.

Mount a piece of brass, drilled and threaded to fit a tripod screw, on the side of the box for taking horizontal pictures.

While not essential, a rack and pinion for accurate focusing can be made from an old clock wheel and a pinion that matches. Cut the teeth from the clock wheel about $\frac{1}{16}$ " below the bottom of the teeth and straighten out the piece to form a rack. Solder a piece of brass to this for mounting on the camera bed as illustrated. Mount the pinion on the camera upright. You can then easily rack the bellows back and forth with your thumb.

Focusing-Hood Extension for Reflex Cameras

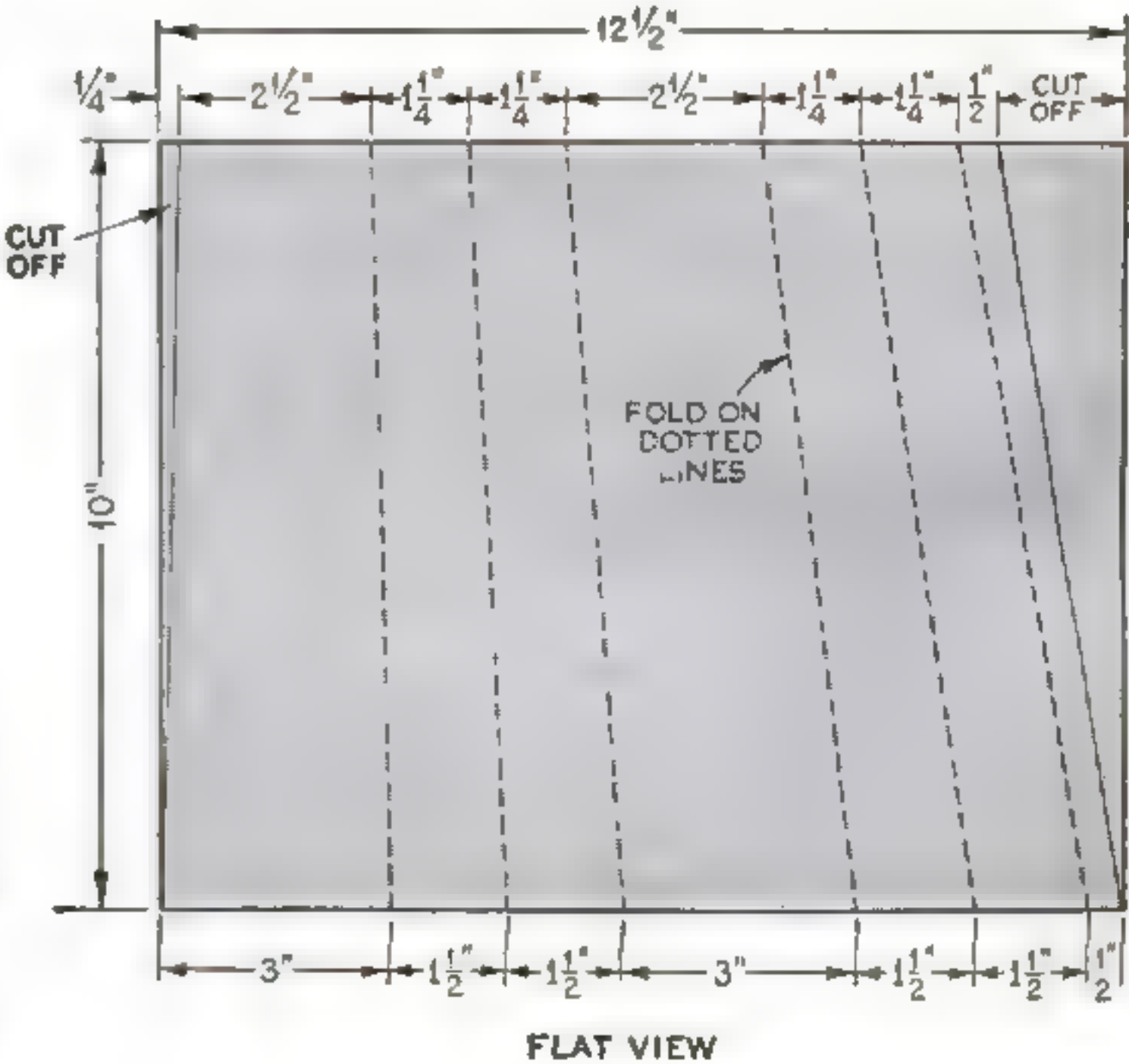
FOR reflex cameras of the type shown, there is nothing like a focusing hood extension to give a clear image on the ground glass when taking pictures in bright sunlight or well-lighted interiors. One can easily be made as shown from stiff black paper similar to that used in photographic albums.

Cut and fold the paper as in the drawings below. The dotted lines indicate the folds. Note that the second and fourth panels and

the $\frac{1}{2}$ " flap at one end are to be folded in as shown in the folded view, and the extending ends are to be cut off. Glue the $\frac{1}{2}$ " flap inside the left end of the first panel

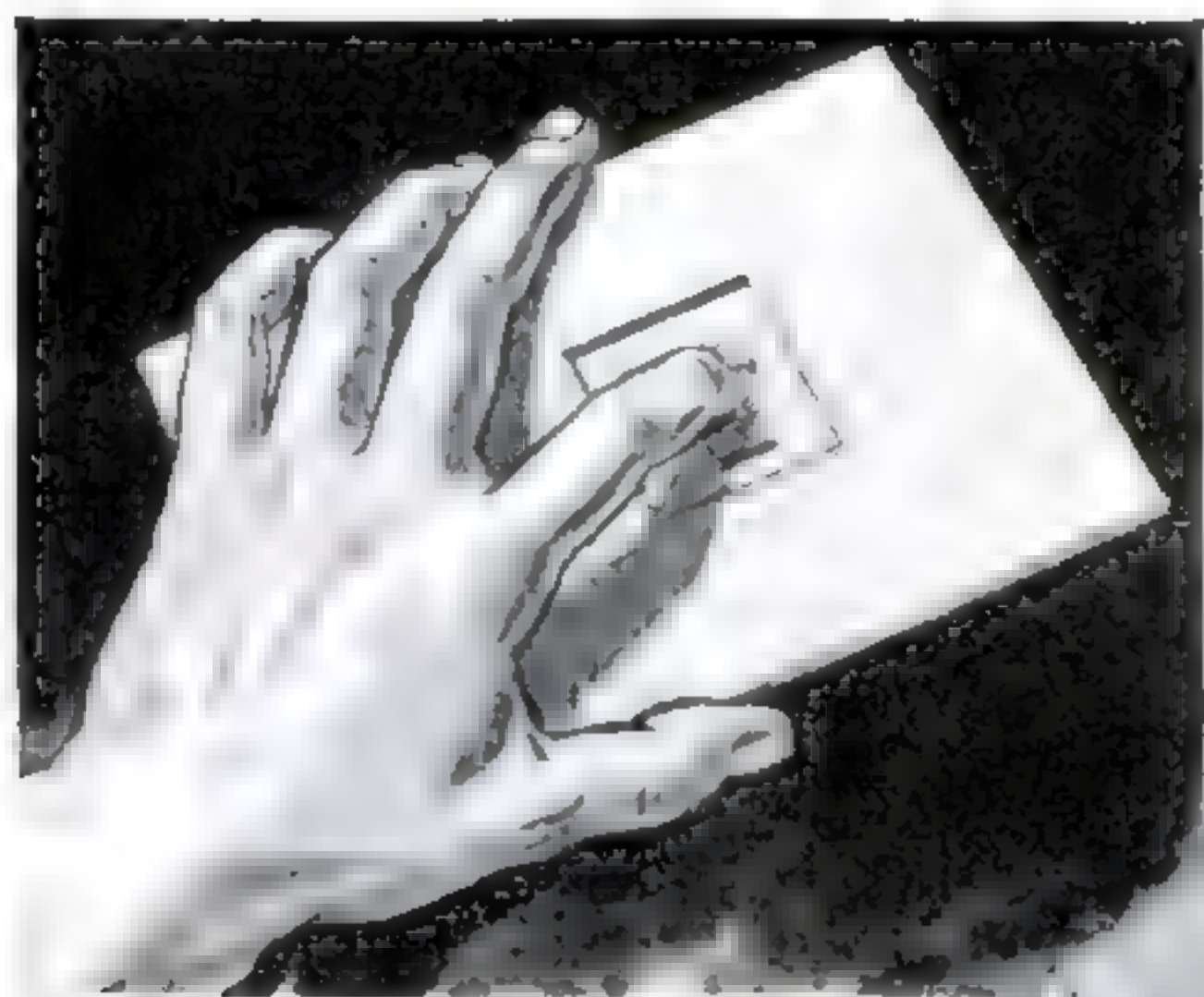
If the size indicated is not suitable for your camera, measure the hood on the camera, allow an extra $\frac{1}{4}$ " or $\frac{1}{2}$ " and draw your own pattern. For example, if the hood measures 5" by 4", mark off $5\frac{1}{4}$ " for the first and third panels, and two units of $2\frac{1}{8}$ " for the second and fourth panels. Lay out the larger end for whatever taper or height you desire. In any case, try out the pattern on scrap paper first.—JOSEPH A. KLOSTER.

When a reflex camera is used in bright sunlight or well-lighted rooms, an extension focusing hood aids greatly in giving a clear image on the ground glass



Laugh-Provoking Photograph

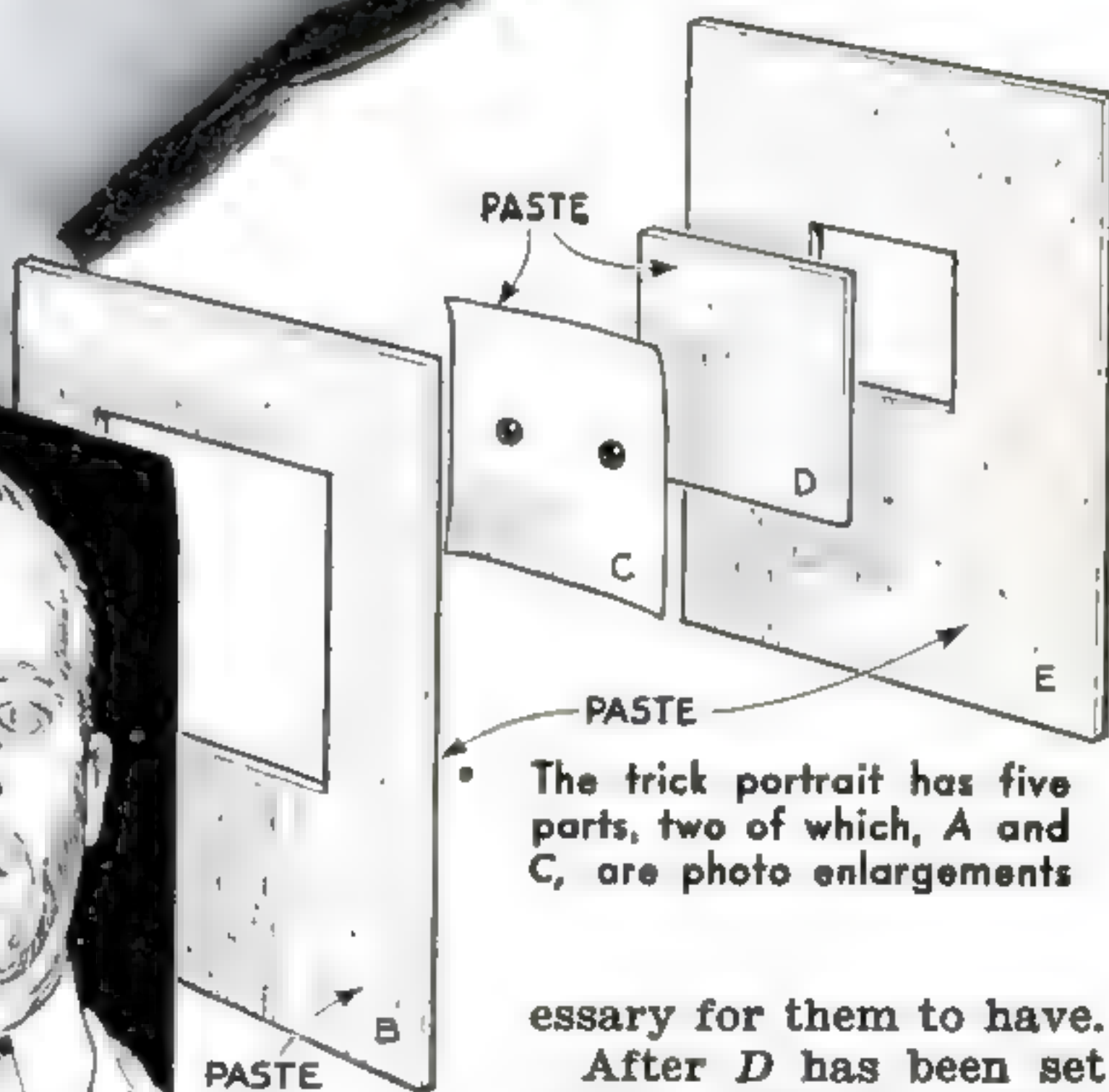
HAS EYES THAT MOVE



How the forefinger is used to shift the position of the eyes and produce funny expressions

HERE is a trick type of enlargement any amateur photographer can make to mystify and amuse his friends. When held up for inspection, it appears to be just an ordinary photograph mounted on a piece of cardboard. As one watches it, however, the eyes begin to move and the face takes on a variety of humorous expressions.

First, the eyes are cut out of an enlargement as shown in the drawings at A. The enlargement is then pasted on a piece of cardboard B, from which a rectangular hole has been cut as indicated. Another set of eyes C is now required. This must be printed with the aid of a mask through which two small holes have been cut so that only the dark pupils of the eye and a little of the eyeball at one side appear against a white background. This set of eyes is pasted on another piece of cardboard D, which is of such a size that it will move inside the opening in B enough to give the eyes the extreme amount of movement it is nec-



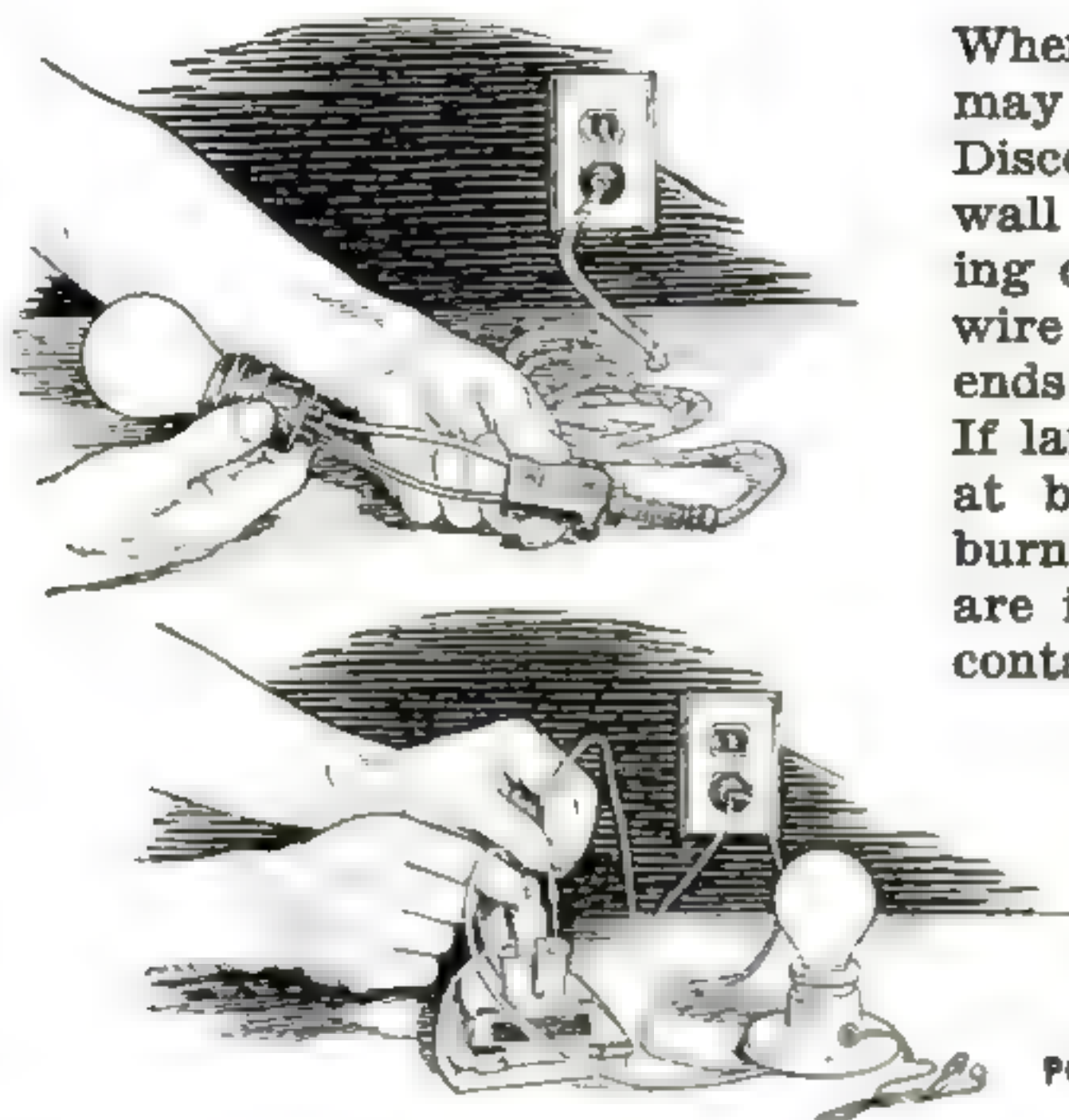
The trick portrait has five parts, two of which, A and C, are photo enlargements

essary for them to have.

After D has been set in the opening, a third piece of cardboard cut as at E is pasted on B to hold D against A, without, of course, preventing it from being moved at will. The moving is done with the tip of a finger. To give readier control, it is well to glue a small square of thick cardboard on the back of D in the center. Hold the picture in a natural manner, not too close to the observers.—GEORGE R. BASTEDO.

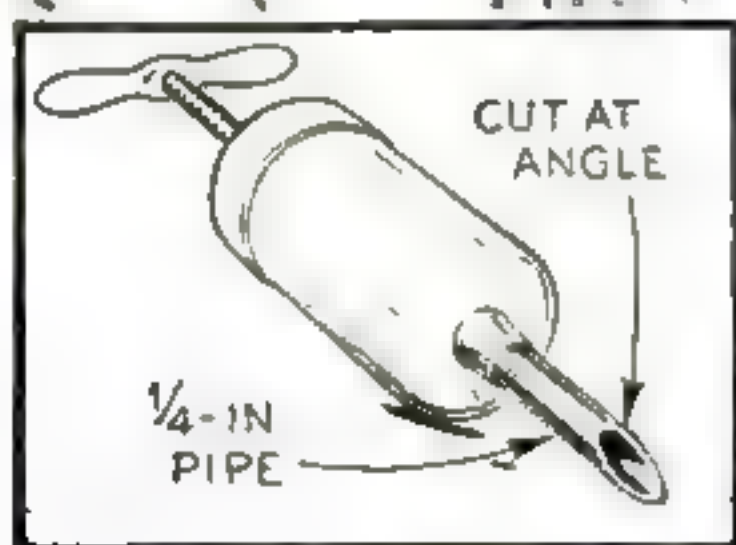
TESTING A FLATIRON

[ELECTRICAL]



When a flatiron will not heat, the trouble may be either in the iron or the cord. Disconnect cord from iron and plug into wall outlet. With a test lamp (consisting of a bulb, weatherproof socket, and wire leads), check by touching bared ends of wires against contacts in plug. If lamp does not light, open connections at both ends and look for broken or burned-off wires. See that spring clips are in good condition and make a firm contact on the iron posts. To test flatiron, use a series lamp arranged as in the lower sketch. The bared ends of the two wires, when touched against the posts of the iron, should cause the lamp to light.

POPULAR SCIENCE MONTHLY SHOP DATA FILE



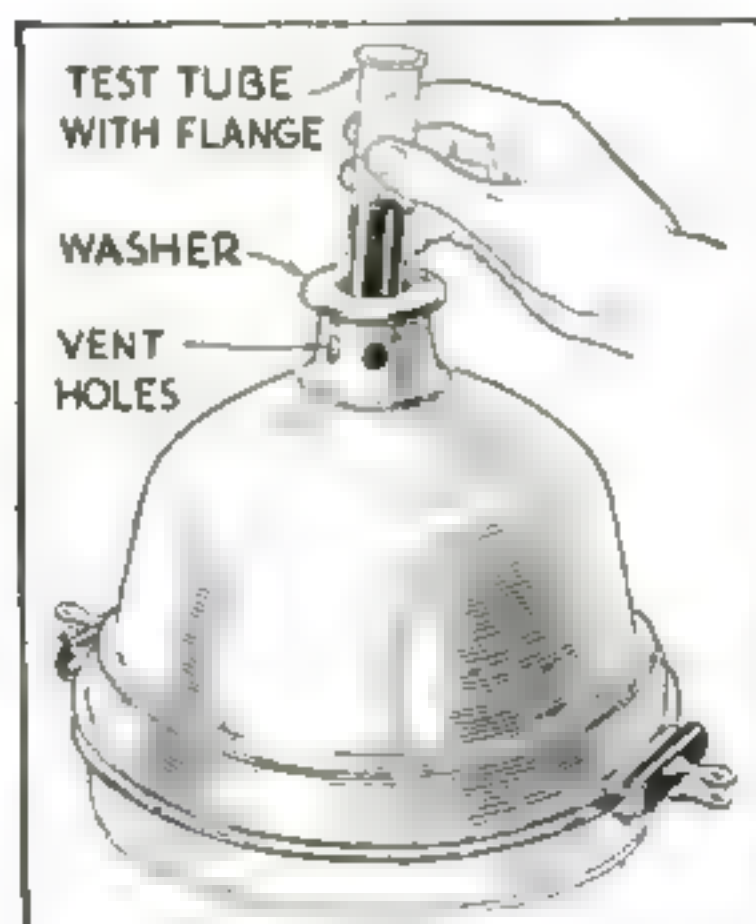
Crack-Caulking Gun

CRACKS around door and window frames and elsewhere outside a house can be caulked efficiently with an automobile grease gun. Screw a 6" length of pipe in the end where the flexible hose is ordinarily attached after cutting the end of the pipe at an angle. Fill the gun with any high-grade caulking compound.—ED RIKHOFF.

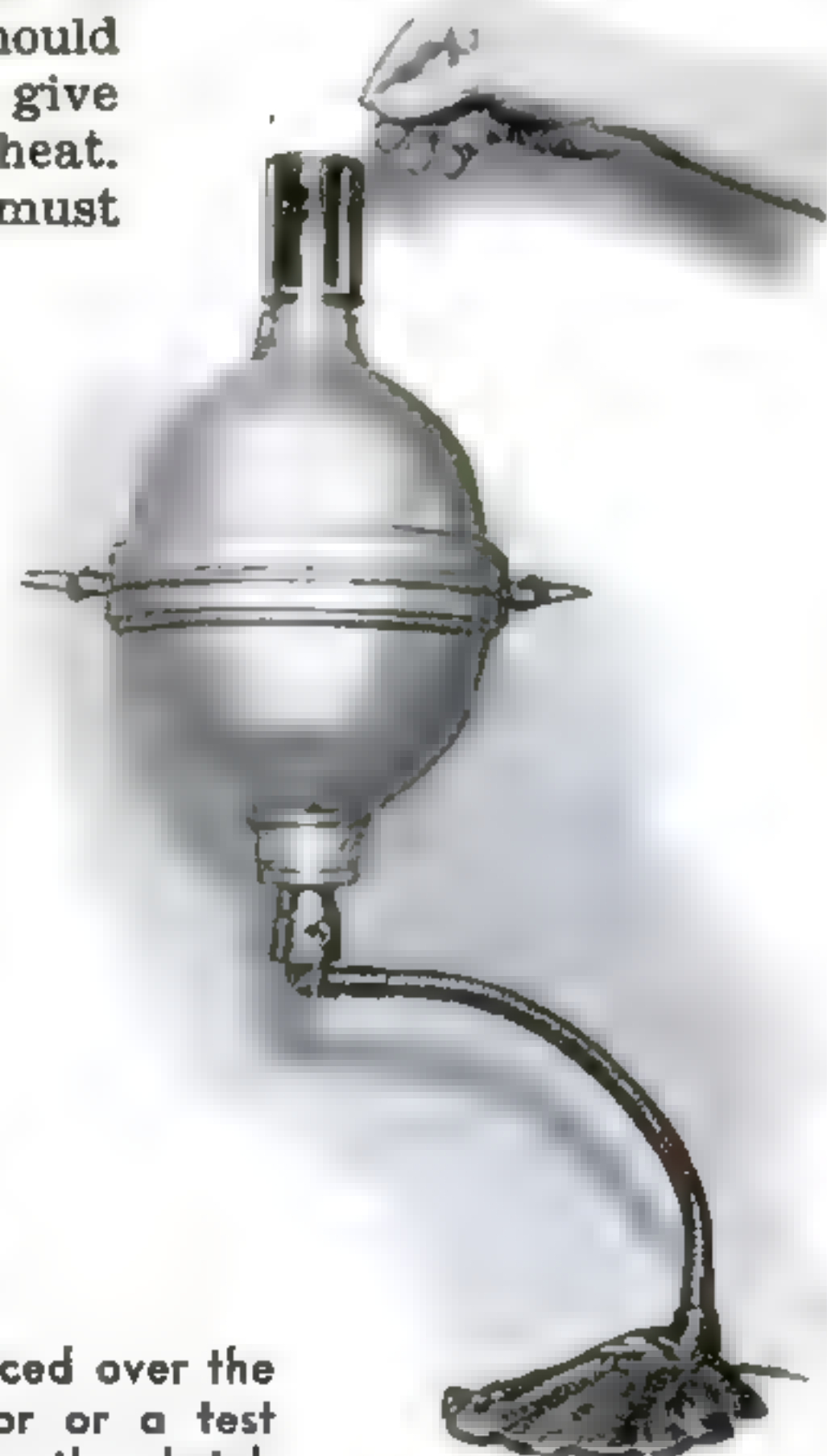
Heater for Waxes and Resins Made from Gooseneck Lamp

WAX, resin, Canada balsam, dragon's blood, and similar substances can be heated without danger of exposure to an open flame by assembling a heater as shown from a gooseneck lamp and an extra reflector. It is equally useful for preparing retouching varnish, ferrotype polish, and acid-resisting enamels. The two reflectors are clamped together with two or more heavy-duty paper clips or battery clips. A lamp should be chosen of a size to give the desired amount of heat. Note that the reflectors must have vents to prevent damage to the bulb.

—CLIFTON COWEE.



A melting dish may be placed over the hole in the upper reflector or a test tube may be inserted as in the sketch



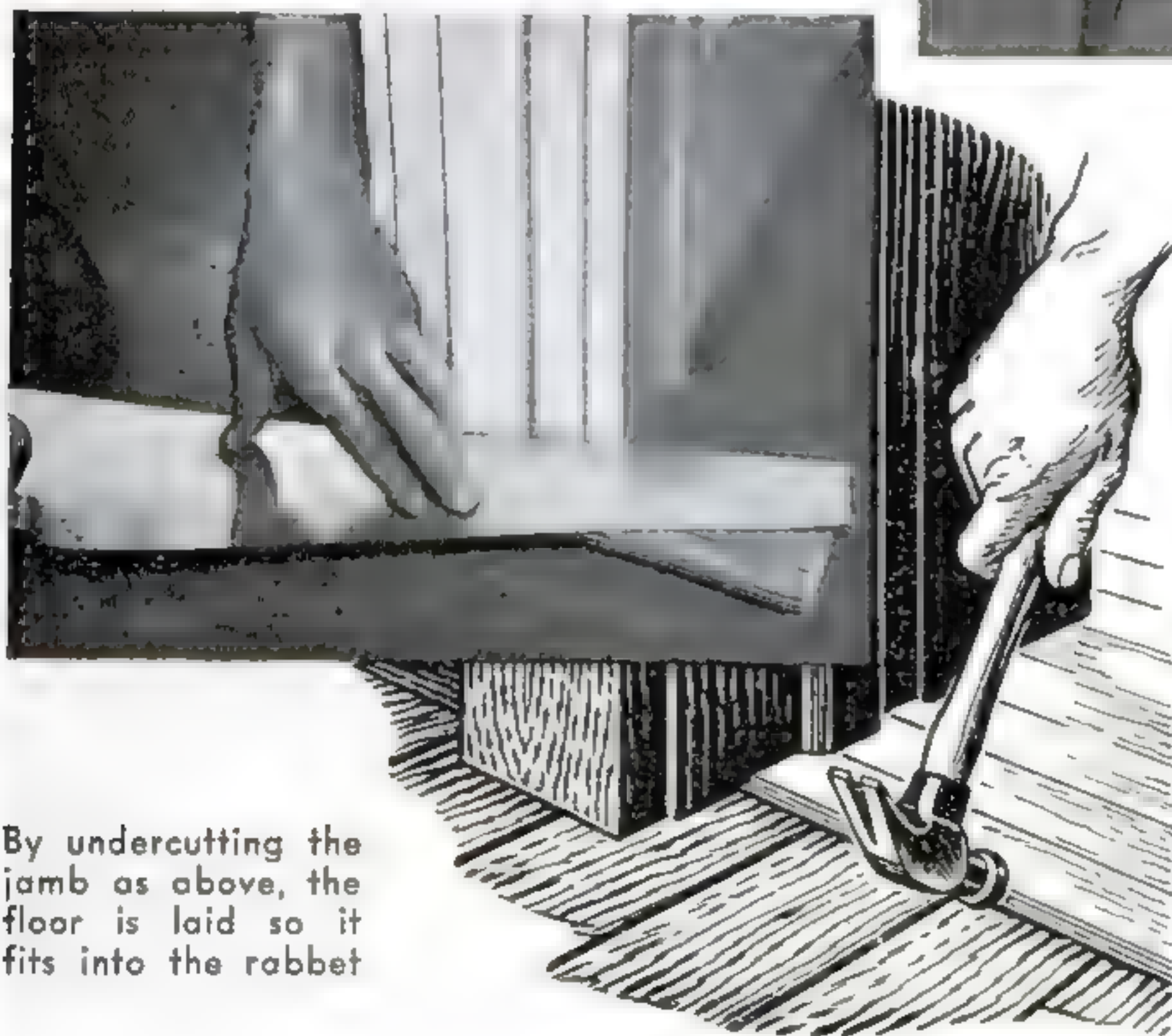
Vacuum Cleaner Frees Machines of Dust

SAWDUST and sander dust is drawn from the small combination circular saw and sander shown at the right by the use of an old vacuum cleaner,* which is placed beneath the bench and has suction pipes to two different ports or openings equipped with funnels. While the sander is being operated, the port leading to the saw is closed, and when the saw is in service, the sander port is shut off. The regulation cleaner attachments with a flexible hose may also be attached to either port for cleaning bench and machines. Protect the motor so it does not get clogged with dust.—WARREN L. BROWN.

*For detailed instructions on installing a vacuum system to free a home workshop of dust, see "Amateur Craftsman's Cyclopedia," pp. 231-233 (Popular Science Publishing Co., Inc., New York, price \$3.50).



Dust from either the sander or the saw is sucked up by the old vacuum cleaner, which is mounted under the workbench



By undercutting the jamb as above, the floor is laid so it fits into the rabbet

Fitting Floors at Doorways

IF A NEW wooden floor has to be laid, many carpenters merely fit the flooring up to the door trim as neatly as possible and let it go at that. When the trim is molded, the time required for this is considerable, and should the flooring shrink, the opening remains an eyesore and a visible dust trap. This can be avoided by undercutting all jambs and casings to a depth of at least $\frac{1}{4}$ ". A piece of flooring under the saw serves as a guide in the manner illustrated. The waste below this cut is then removed with a narrow chisel. As the flooring approaches the trim, it is laid so as to pass into this rabbet.—R.O.L.

Yellow Paint Brings Out Markings on Steel Rule

THE etched markings of small steel rules may be made more plainly visible by rubbing a small amount of yellow or orange paint into them. The paint is allowed to dry and the surplus removed by a light application of fine steel wool.

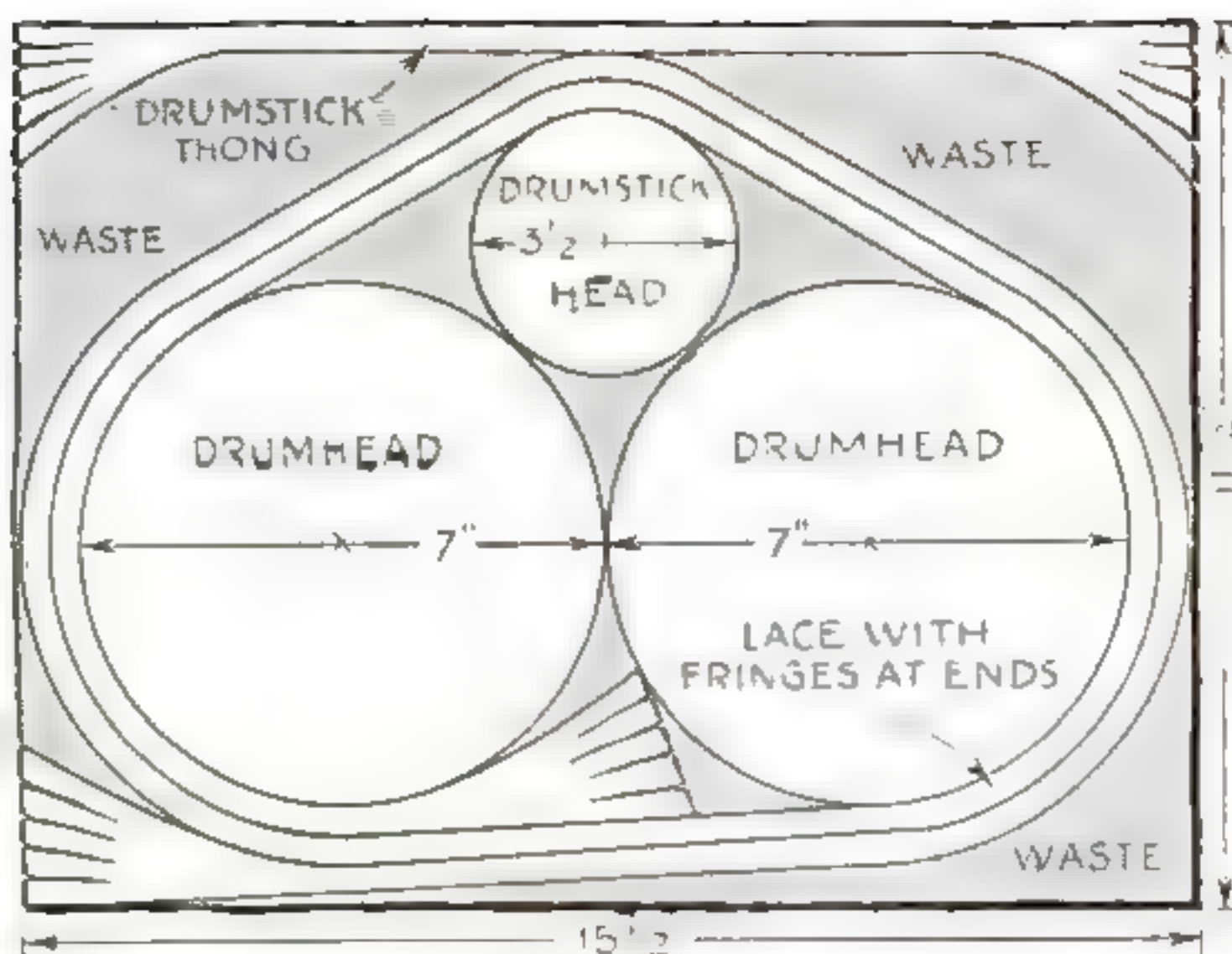
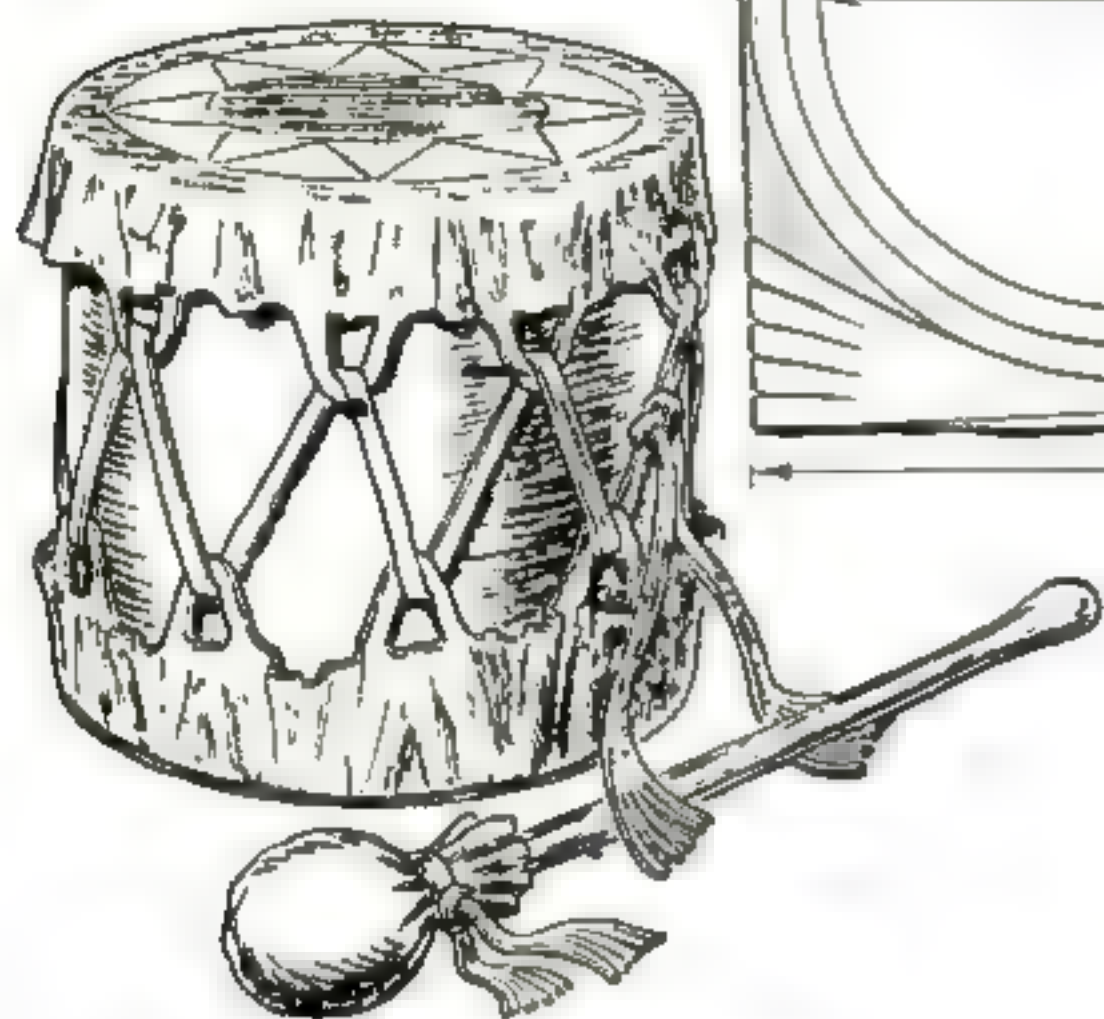
Tightening Brace Wires

A TIMESAVING tool for tightening the brace wires used on cribbing or concrete forms may be made from a discarded wood bit, which is heated and formed into a hook.



Wires for bracing a concrete form are quickly twisted with this hooklike tool

Two drumheads, the long, fringed lace, the drumstick head, and the thong for the stick are cut from a piece of soft leather



A wide tin can with both top and bottom removed acts as the body of the drum, and drumheads are stretched over this



Child's Indian Tom-Tom Made by Stretching Leather over a Coffee Can

A TOY Indian tom-tom may be made from a coffee can of the type shown and a piece of soft tan leather, bought at a shoe repair shop. Cut the bottom from the tin with a rotary can opener that leaves the edge smooth and rounded. Soak the leather to make it stretch easily, and cut it as indicated. Eight holes must be made in each drumhead large enough

for the lace and its fringes to pass through. Do not pull the lace too tight or the eyelets will be ripped. Apply the leather with the rough side out so that the decorations may be painted on with ordinary water colors. Wrap cord in a ball around the knob of the drumstick and then stretch leather over the end.—HERMAN E. RUDOLPH.

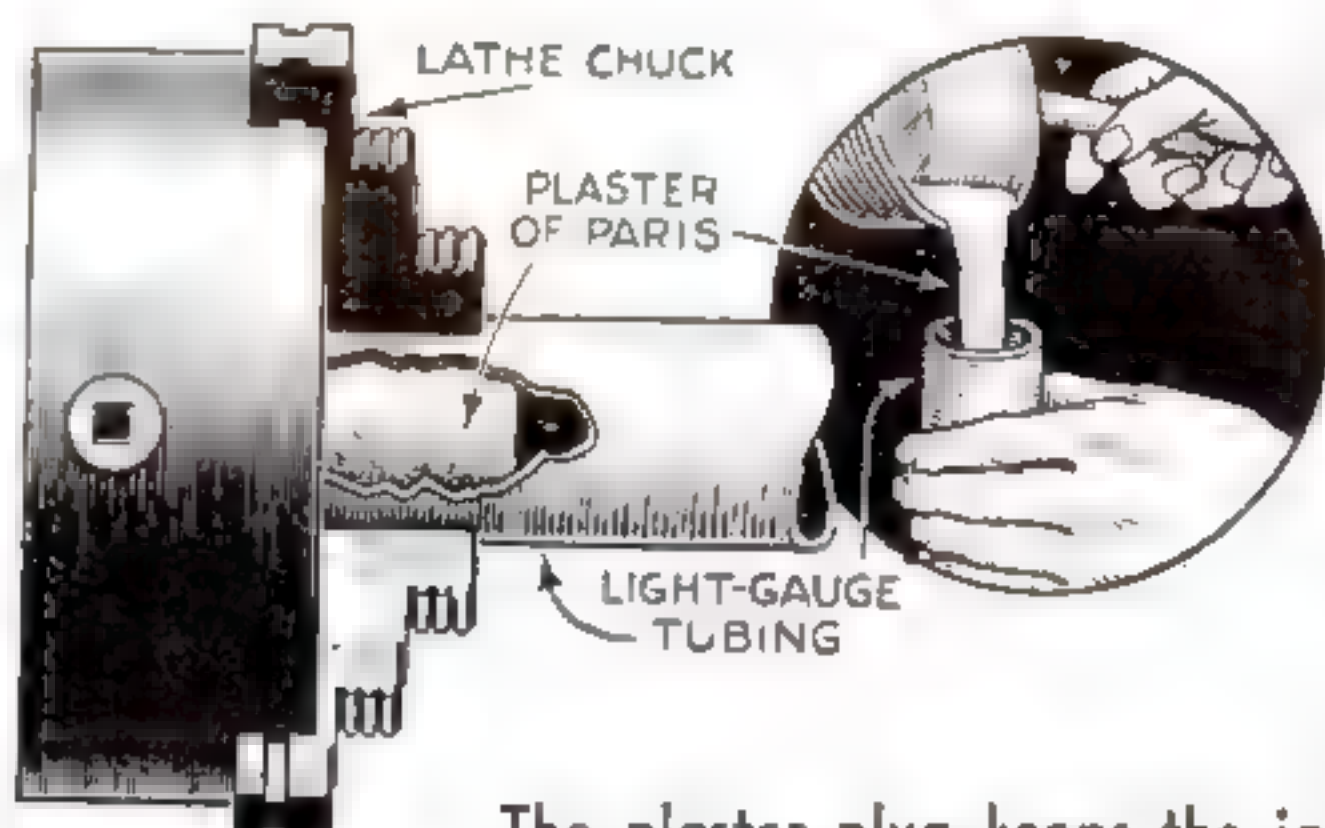


Renewing Old Stamp Pads

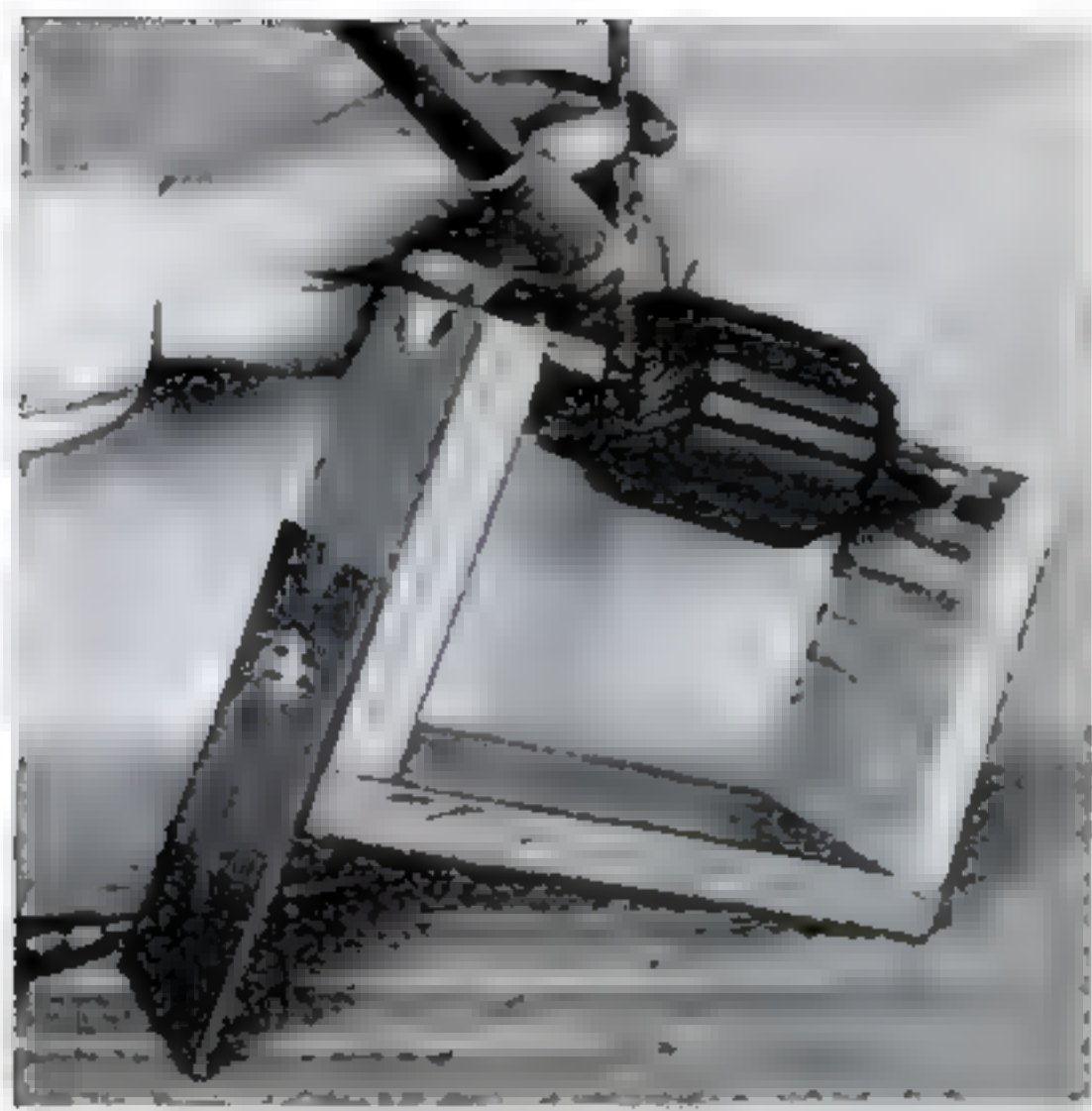
WHEN a stamp pad dries up and suitable ink is not immediately available for renewing it, pour about half a teaspoon of glycerin on the surface and work it in with a spatula or knife blade as illustrated above. This will temporarily restore the usefulness of a pad, whatever its color happens to be.

A Plug for Thin Tubing

IN MACHINING light brass tubing on my home workshop lathe recently, I found that a plug of good, hard plaster of Paris served the same purpose as a plug made of wood and proved more satisfactory. The plaster plug may be removed easily by soaking it in water and then cutting it out with a sharp knife.—G. O. LAWRENCE.



The plaster plug keeps the jaws from distorting the brass tube

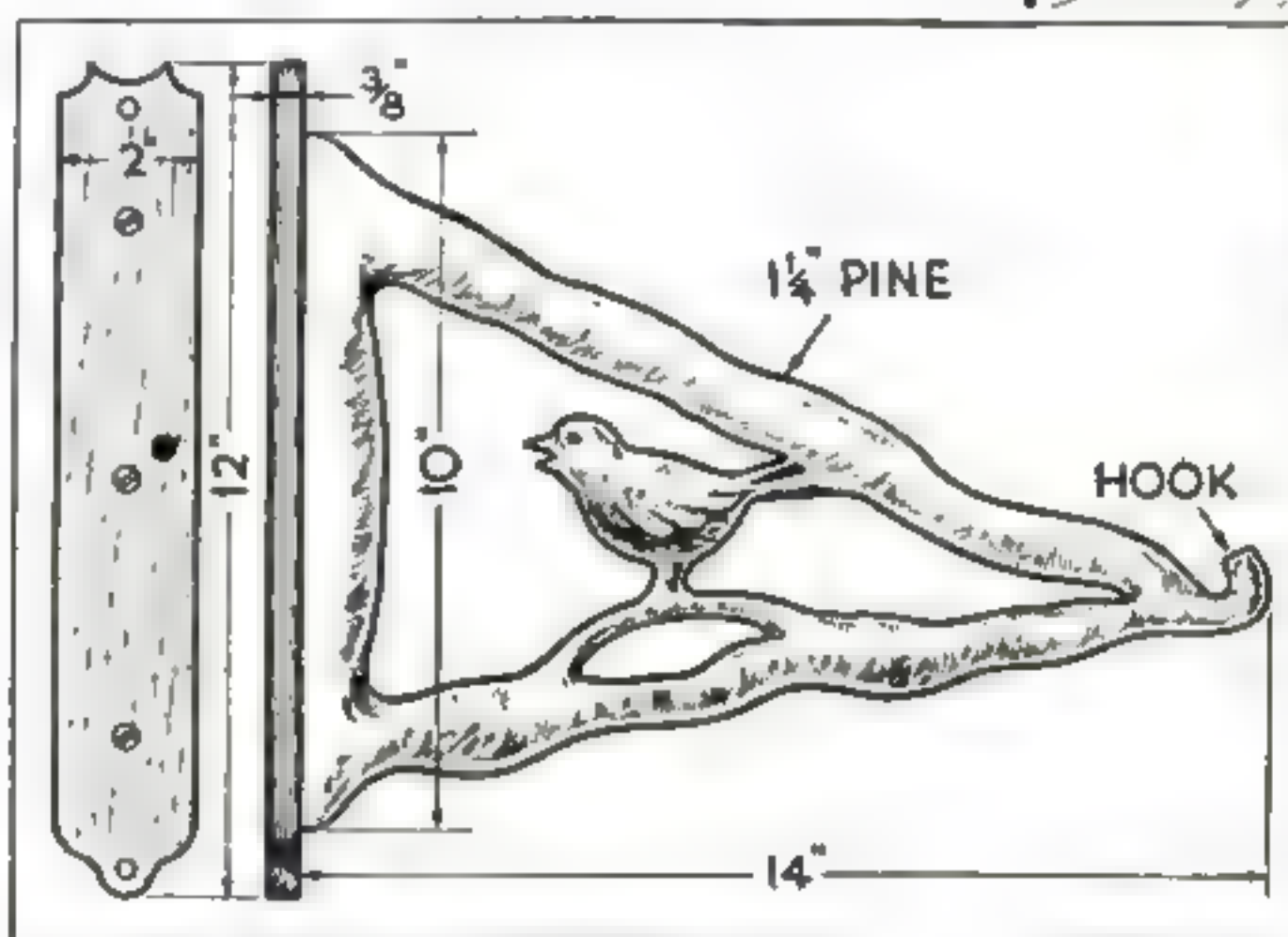


Armature Rack Set on an Angle for Soldering Leads

IT IS desirable when soldering armature leads in the slots of the commutator risers to have the armature set at an angle so the flux and solder will not run down between the bars. This can be accomplished by adding a sheet-metal or stiff fiber plate to the armature rack as shown above. Cut a vertical slot in the center of the piece so that the rack may be adjusted by means of a large stove bolt to any desired angle for the work at hand.—W.C.W.

Rustic Hanger for Bird Cage

ANYONE handy with a pocketknife can make a bird-cage hanger of rustic design like the one illustrated. Draw the design full size on sugar pine $1\frac{1}{4}$ " or $1\frac{1}{8}$ " by 10" by 14", jig-saw it carefully to shape, and round the bird and branches as naturalistically as desired. The supporting shield for the original was made from a scrap of hardwood flooring $\frac{3}{8}$ " by 2" by 12". Drill two holes for fastening to the wall.—R. A. O'LEARY, SR.



The hanger is jig-sawed from wood, then rounded with a knife

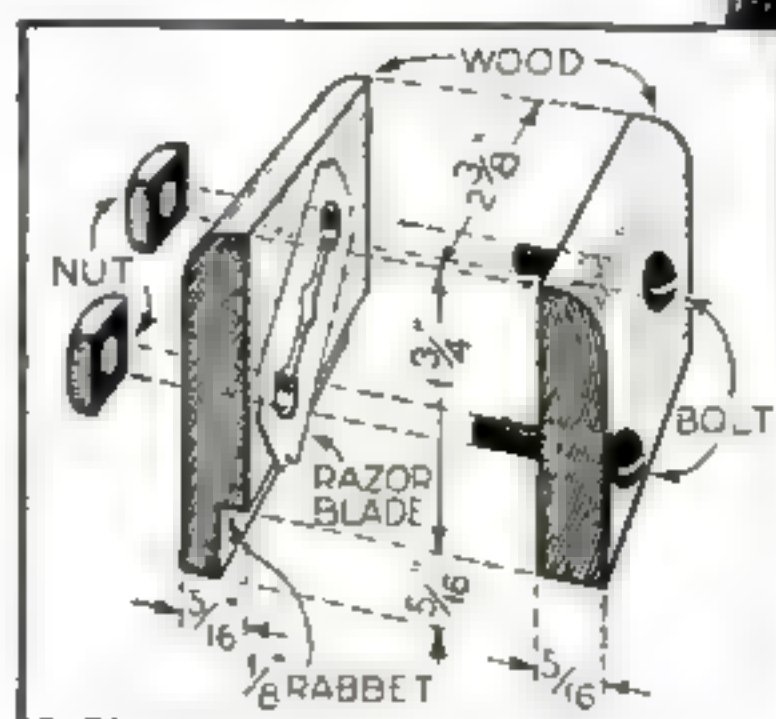


Bottles Rest on Casters

BOTTLES of photographic solutions or chemicals will not stain or mar the surface of laboratory benches and shelves if they are set on large glass furniture casters of the kind shown. These are inexpensive, neat in appearance, and easily cleaned. As an additional precaution, always hold a bottle with the label side up when pouring so that the label will not be defaced by the drippings.—W.K.

Razor-Blade Slitting Tool Opens Cardboard Boxes

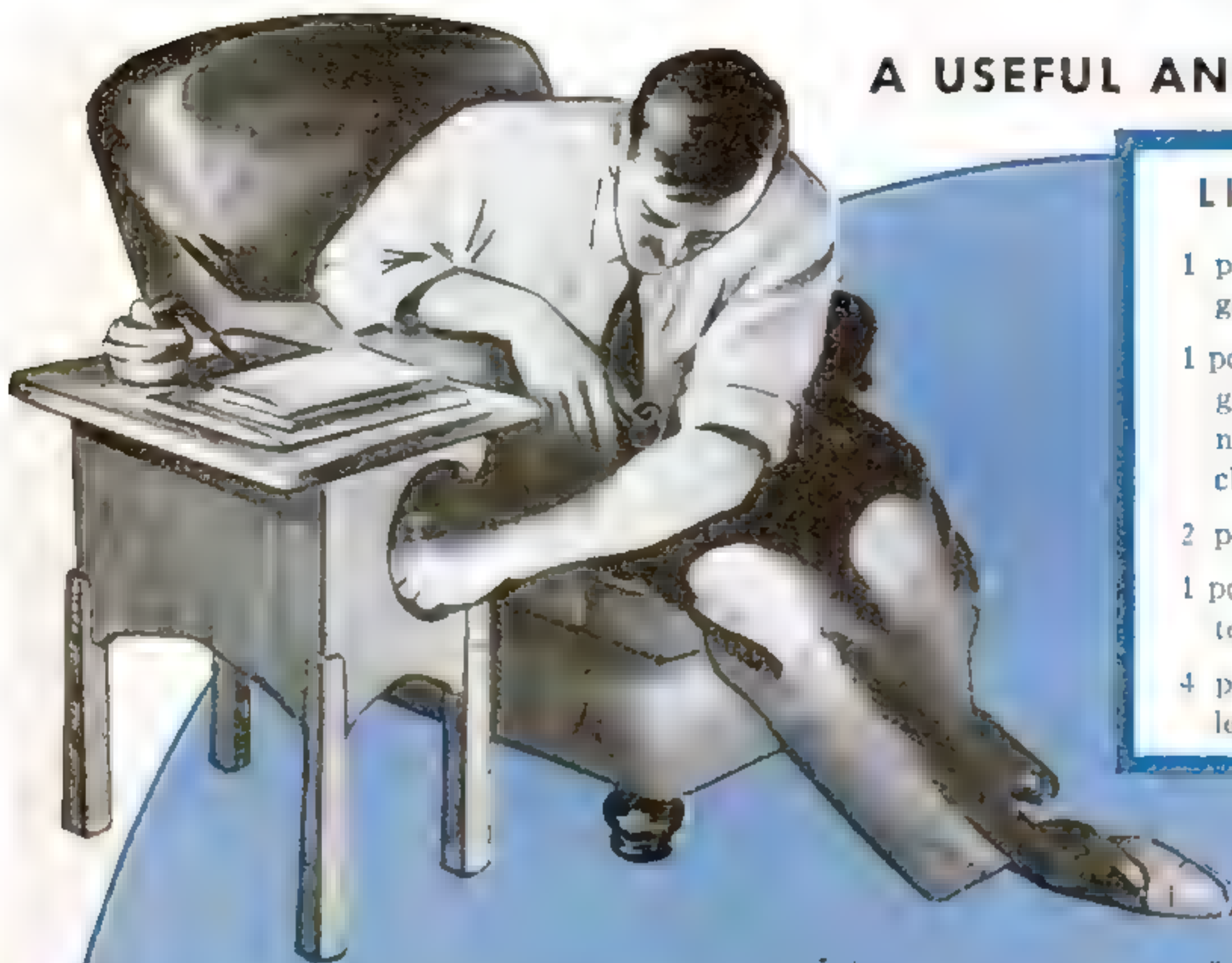
CARDBOARD boxes such as those containing cereals or soap flakes are quickly opened with the tool illustrated, which consists of two small blocks of wood with a razor blade fastened between them. Note that one piece is rabbeted at the bottom to serve as a guide. The tool can also be used for cutting slits in boxes.—E.W.L.



A razor blade is set between two pieces of wood as at the left, and used to slit open boxes as above

LOW STAND....

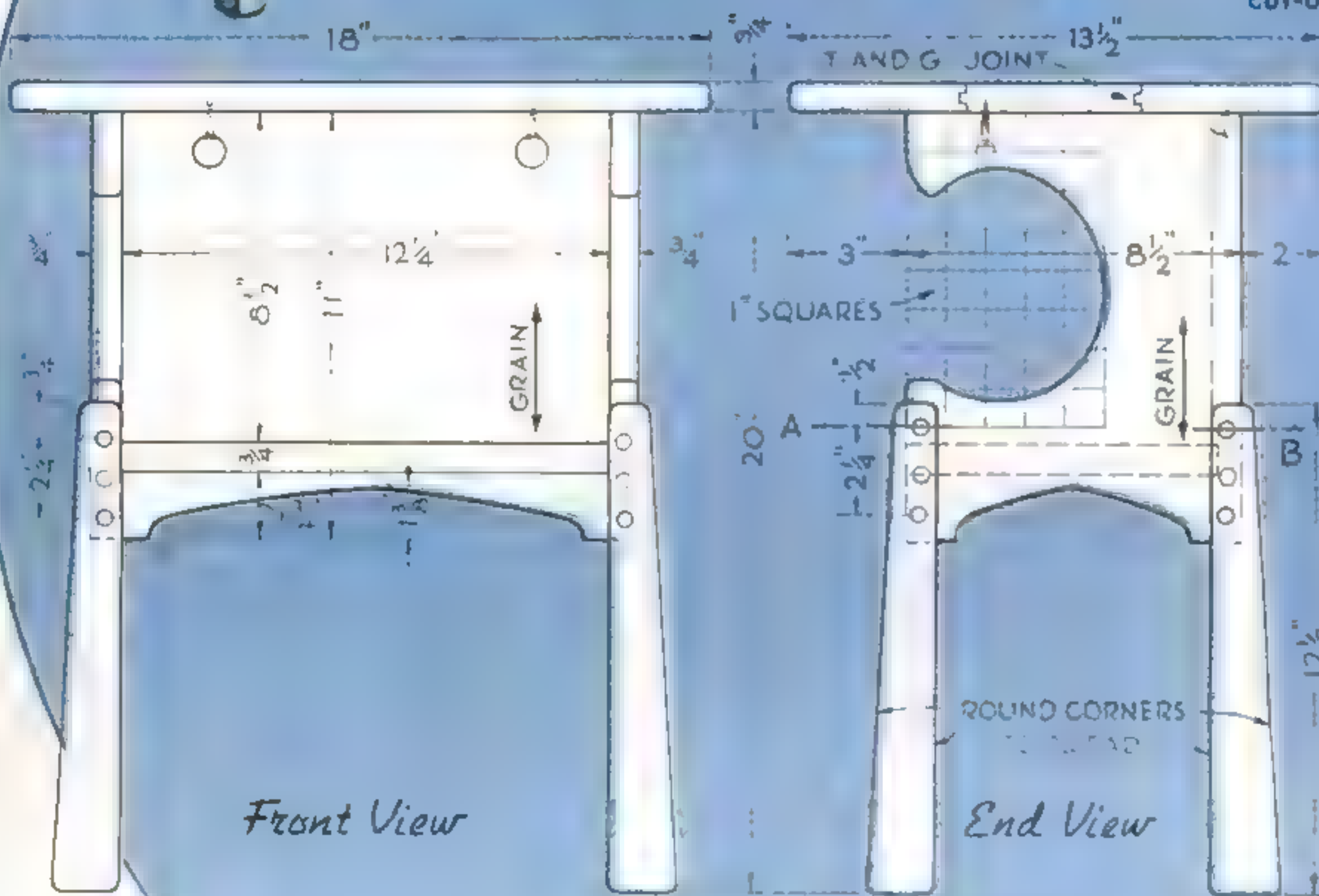
A USEFUL AND DECORATIVE PIECE



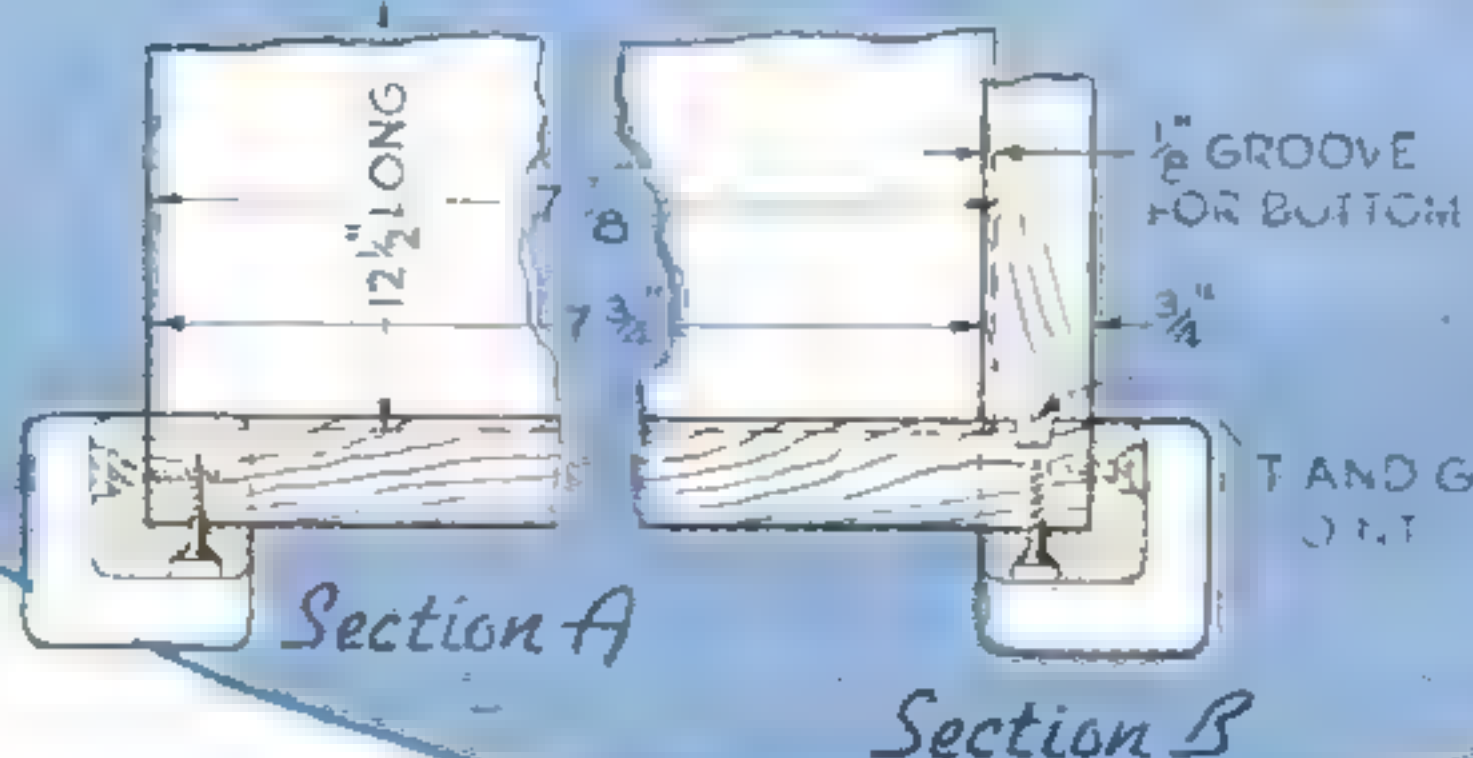
LIST OF MATERIALS

- 1 pc. $\frac{3}{4}$ " by $13\frac{1}{2}$ " by 18" for top; glue up from 4" or 5" boards.
- 1 pc. $\frac{3}{4}$ " by $12\frac{1}{2}$ " by 11" for back; glue up to width with grain running the short way. Length includes $\frac{1}{8}$ " tongue on each edge.
- 2 pc. $\frac{3}{4}$ " by $8\frac{1}{2}$ " by 11" for sides.
- 1 pc. $\frac{3}{4}$ " by $7\frac{7}{8}$ " by $12\frac{1}{2}$ " for bottom.
- 4 pc. $1\frac{1}{8}$ " by $1\frac{3}{8}$ " by $12\frac{1}{2}$ " for legs; taper to $1\frac{1}{8}$ " by $1\frac{1}{8}$ " at top.

Smoking accessories can be easily reached through the cut-outs in the end pieces



Front and end assembly views of the low stand; a sketch of one of the legs; and cross sections of the joints at front and rear corners. Maple is a good wood to use



Detail of Leg

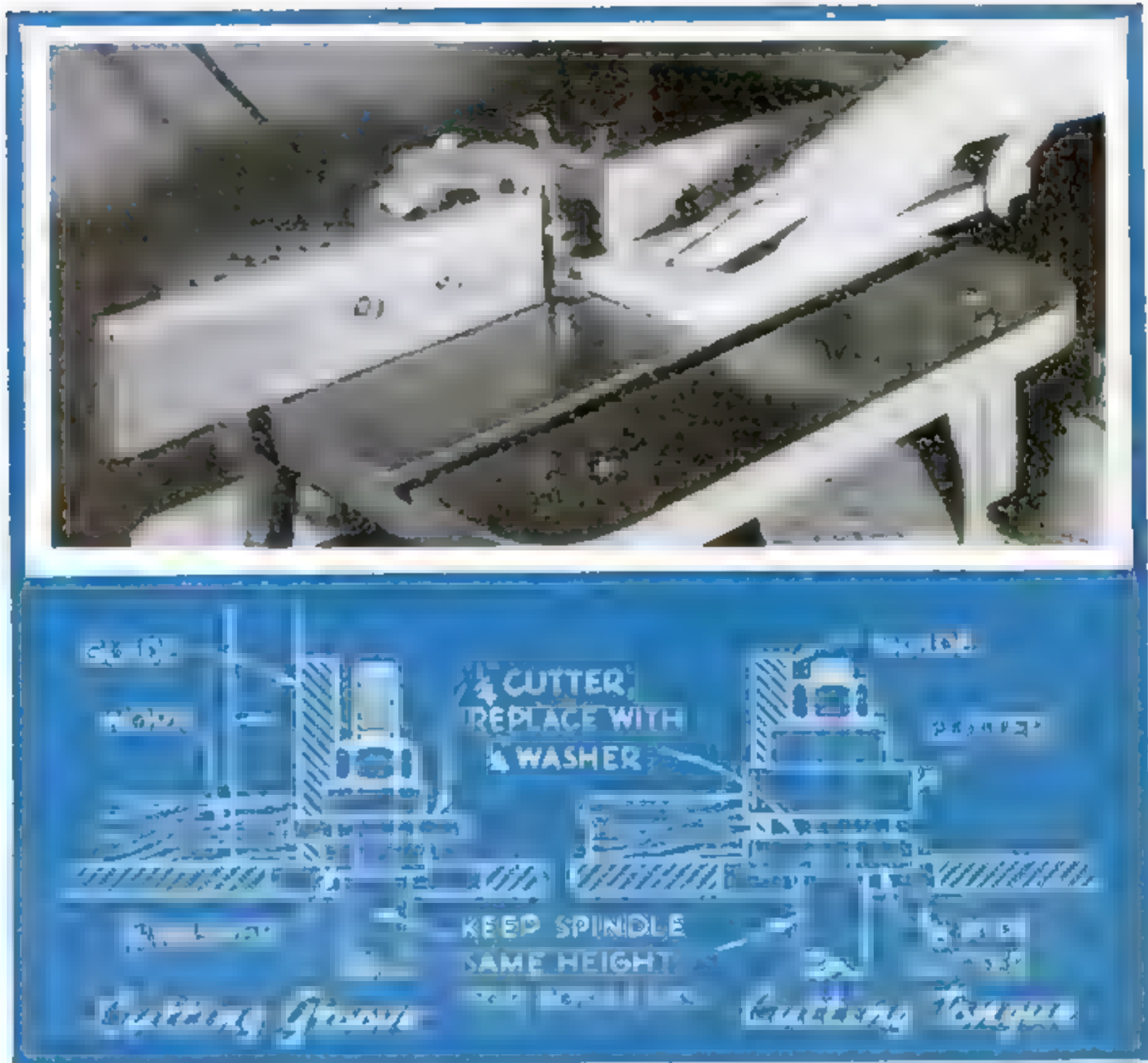
Early American Style

DESIGNED TO BE PLACED BESIDE A LOUNGING CHAIR

BECAUSE of its small size and the accessible compartment beneath the top, this low stand is specially suitable for a smoker's use alongside a lounging chair. Its lines stamp it as Early American, therefore maple is one of the most appropriate woods to use.

The top may be glued up with doweled or splined joints, but if a wood shaper is available, tongue-and-groove joints may be cut quickly by the method suggested in the illustrations at the right. The cutters must have the same cutting radius, and the thickness of the $\frac{1}{4}$ " and $\frac{3}{8}$ " washers must correspond exactly to the width of the cutter with which they interchange. Note that the same type of joint is used to join sides and back as shown in section B.

Grooves $\frac{1}{8}$ " by $\frac{3}{4}$ " are cut in sides and back for the bottom, which is secured with screws at each corner, placed so they will be concealed by the legs. The legs are tapered on two adjacent sides only, making them flare out.



Diagrams of the two shaper set-ups and, above, cutting a tongue

Use water stain to get the desired shade, and for maximum durability apply a rubbed varnish finish.—DONALD A. PRICE.

Ordinary Open Shelving Protected from Dust by a Window Shade



An effective dust cover for shelves where appearances are not important

IN BASEMENTS, workshops, attics, and other rooms in the house where appearances are of little importance, it is customary to keep books, magazines, reference materials, and supplies of various sorts on open shelving or discarded bookshelves, and it is always a problem to keep out the dust. This can be done very inexpensively, however, by mounting a window shade on the top as shown. A wire curtain rod is fastened across the front edge of the top, and wires running down each side about 3" from the edges serve to keep the shade from being blown or accidentally pushed aside. The wires run through screw eyes inserted as shown.

How to Install MODERN

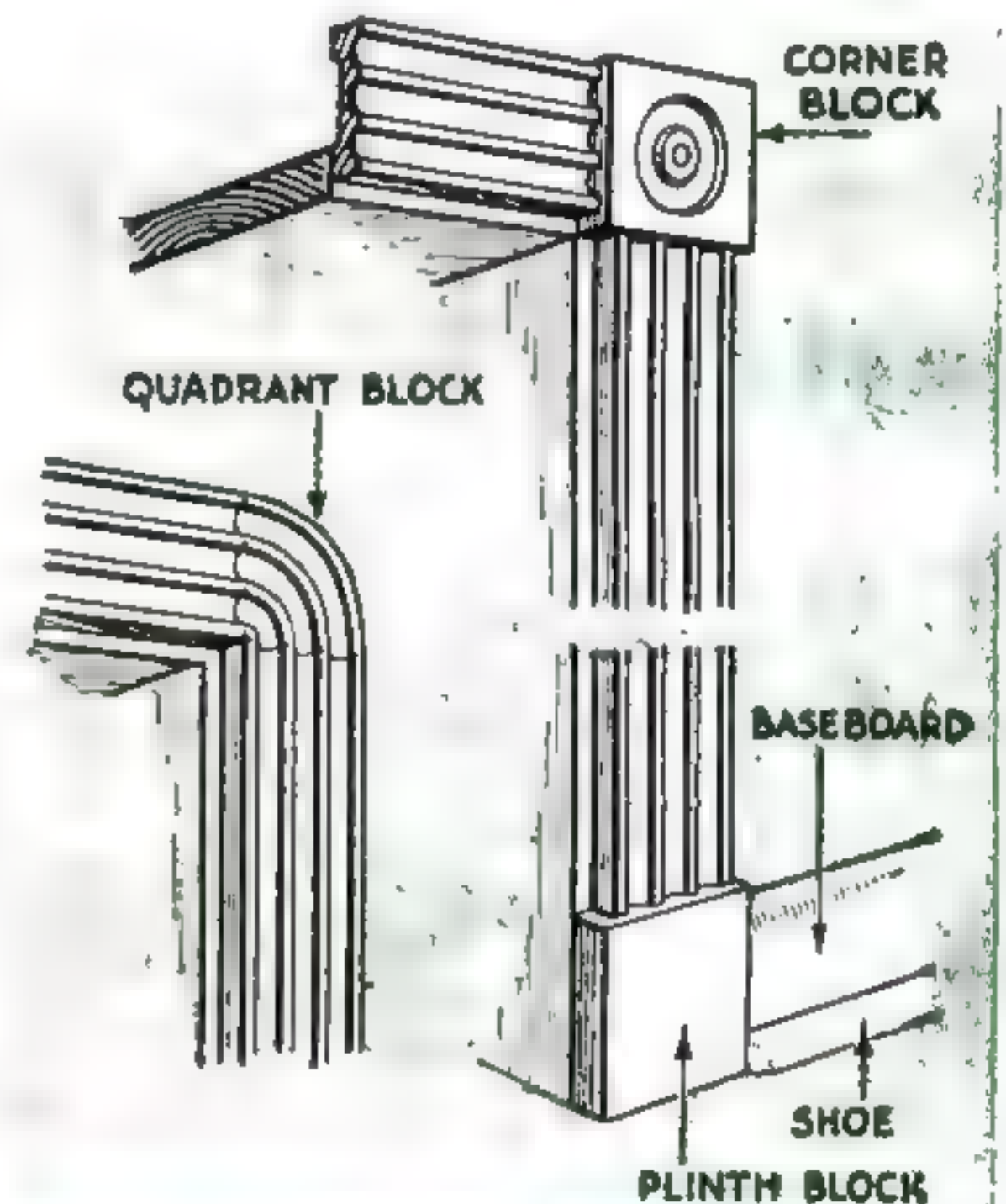
By Edwin M. Love

ONE excellent way to improve a room is to replace old woodwork with new. Such modernization gets rid of scuffed paint or faded stain, and is a desirable preliminary to repapering or repainting the walls. The cost of materials is low, and the remodeling can be done, a door or a window at a time, as opportunity permits.

The illustrations show styles of trim suitable for the home mechanic's use. Mitered moldings, the narrower, the better, are most popular. How-



All removable hardware should be taken off before the woodwork is painted. In circle, a corner block tacked in place. The drawings above show two popular styles



WOODWORK in Any Room

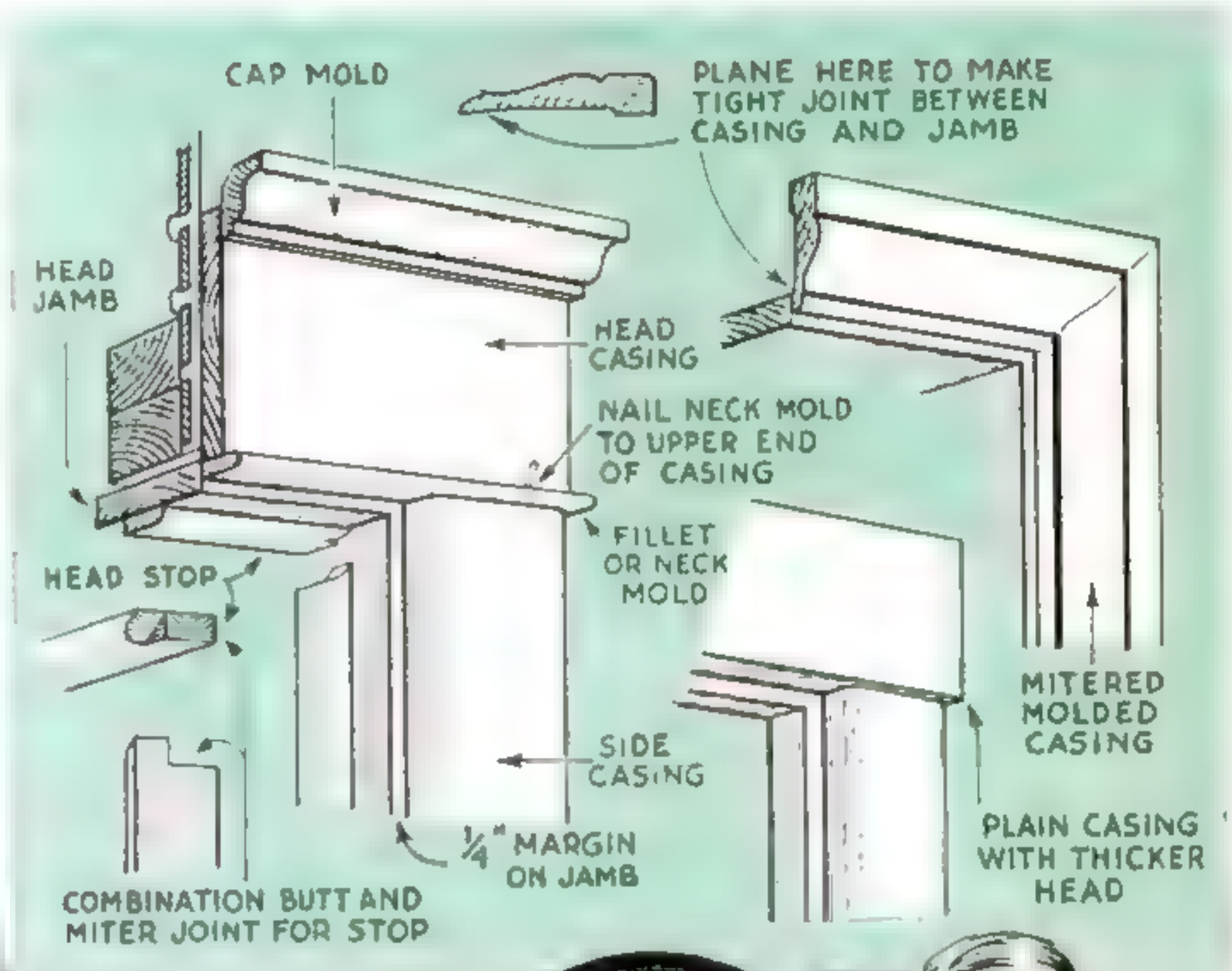
ever, unless you extend the present plaster with well-troweled patching plaster, it is necessary to use casings about as wide as the old ones, or raw edges will show. In any event, the casings must be wide enough to cover the weight pockets of double-hung windows.

You can probably find a stock design of trim that you like, but any mill will make a special pattern for a nominal extra charge. If you have a shaper, you can make your own.

When pulling off old trim, pry outward with a wide chisel, taking care not to break the plaster. To salvage the lumber,

pull the nails through the back with pincers or pliers, leaving the putty undisturbed.

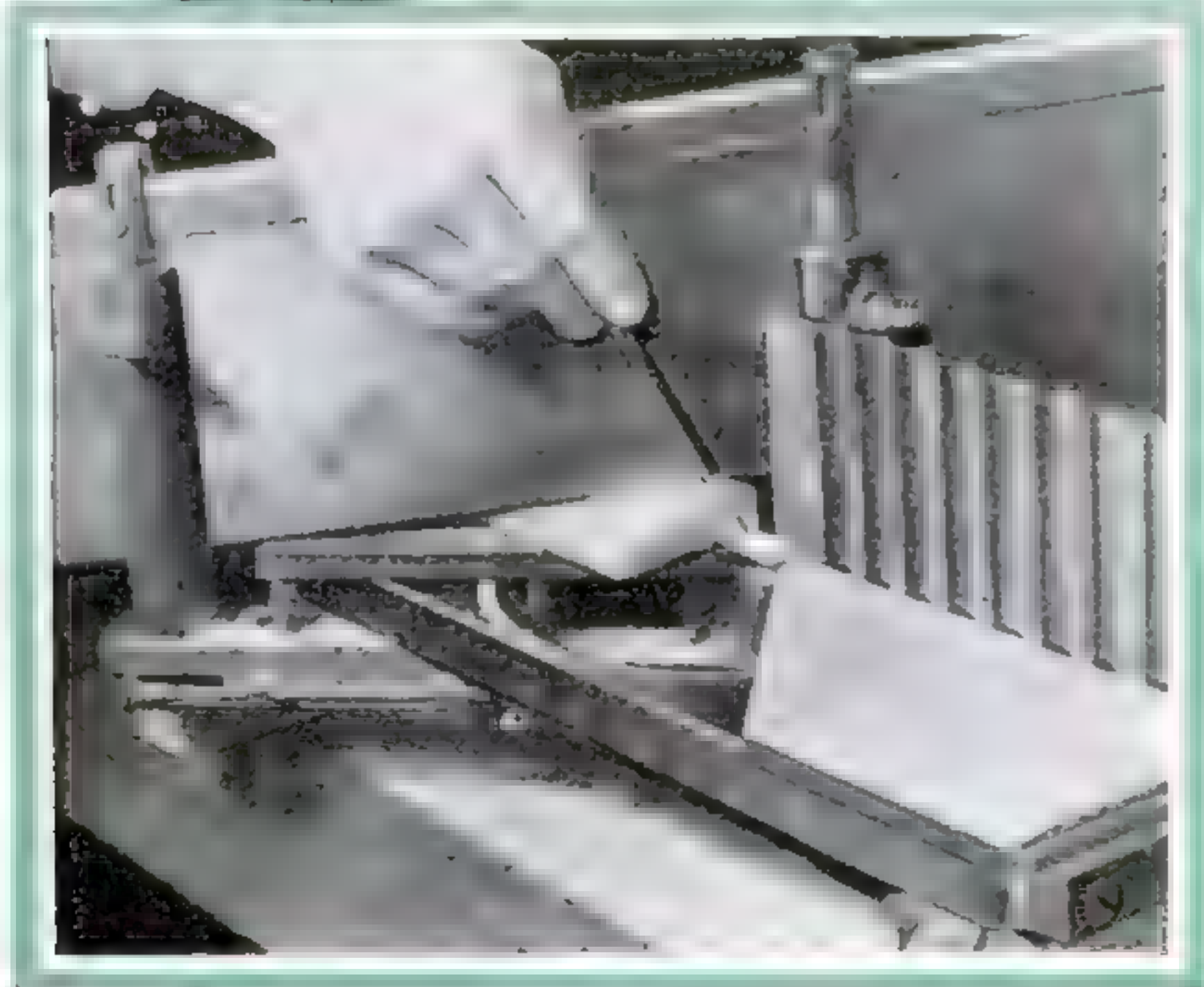
Side casings should be scribed to the floor, as a square cut may not fit. If the door frame is out of square, use wedges between the casing and the side of the miter box to make the cut correspondingly out of square. In places where the plaster bulges much, you



Various ways to apply the trim. Left, toenailing head casing down on side casing



Above and in circle, a wedge is used in the miter box to compensate for a door or window frame out of square. Use the wedge as shown at left if bulging plaster holds out back of a mitered casing



may have to gouge out the back of the casing before it will nail flat. A sprung casing can often be straightened as it is nailed to the stud, but don't depend on the jamb, for it will merely spring to fit the casing. If plain trim is used, with a heavy head casing, cut the head to project over the edges as much as in front, or more, as you wish, and toenail it down against the side casings.

Years ago the corner-block and plinth style of trim was in vogue. It is being revived to some extent today, especially in modernistic treatments. The plinth blocks are flush with the jamb faces, and the side casings rest upon them. Nail up all three casings and force the corner blocks into the angles. If you have a lathe, you can decorate these blocks with rosettes, or a simple geometric design may be carved. An interesting variation is the quadrant block, which bends the casing around the corners.

With mitered casings, true miters will not fit if the back edges are forced out by bulging plaster. To remedy this, put a wedge of corresponding thickness under the back edge of the mold when cutting it, and little work with a block plane will be needed. Nail the left casing, fit the head casing to it, cut to length, and nail up the right casing, leaving the upper end tacked. This allows a little adjustment for fitting. When the joint is good, finish nailing the side casing and force the head casing between them. If the fronts are not flush, pare them with a chisel, but for best work plane off the back of the thick casing so that the fronts will nail down flush.

Windows are cased in much the same way. Mullions can be built up from rippings of regular casing stock and notched into the head to become one member with it.

If a molding miters all around a window, fit the joints and tack the casings for trial before nailing them permanently.

Put down long pieces of baseboard first, scribing the corner joints and working toward the doors. A quickly made base hook of the type illustrated will insure snug joints against the casings. Make a tight fit, but too much length on the board is bad, for it forces the jamb and makes the door bind. A very short piece of base, between a corner and a casing, should be put in before the joining member, so that the latter will help to hold it. For paint work, run the grain of such a short piece vertically, thus minimizing danger of splitting.

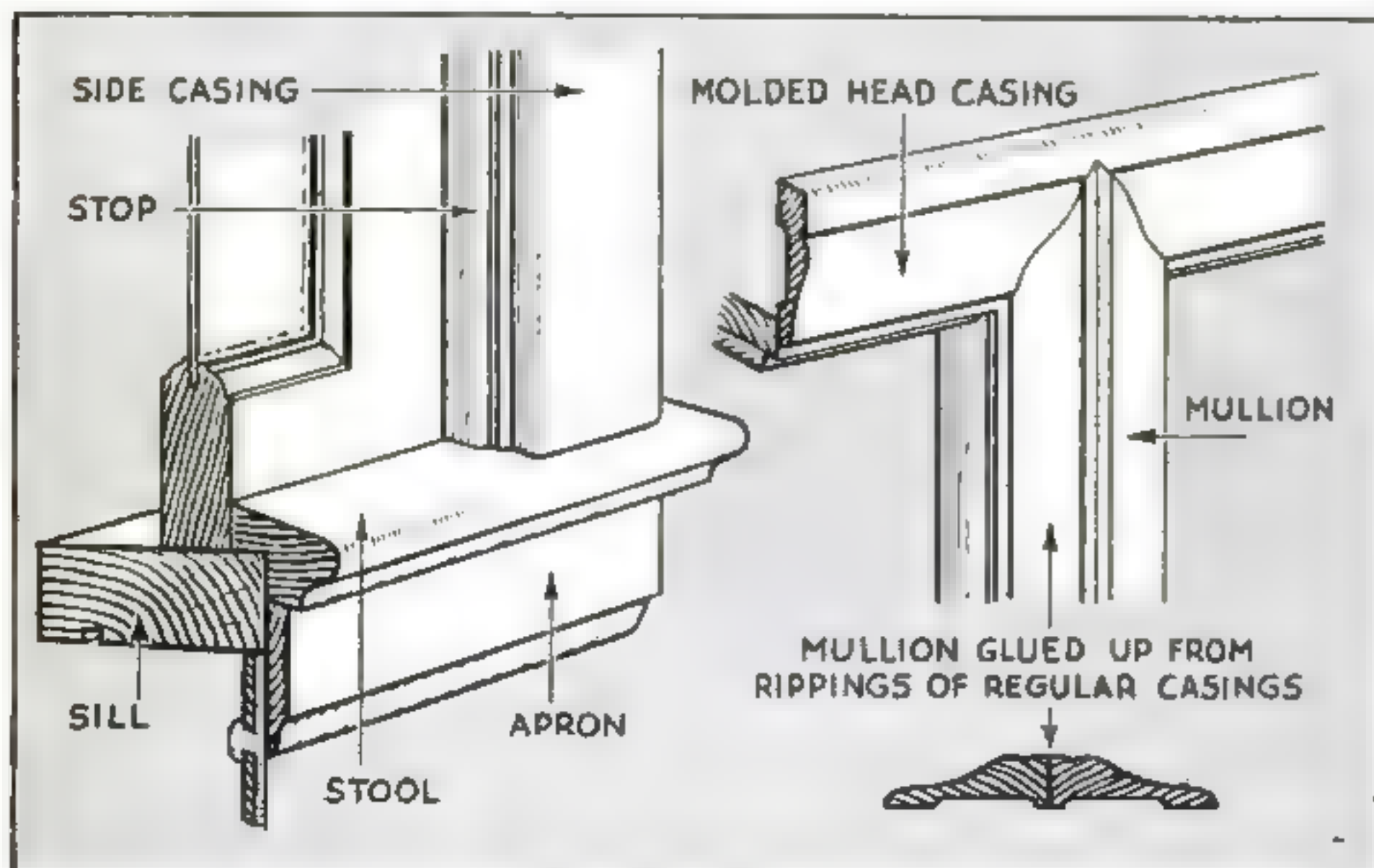
Base shoe is coped at the corners and cut off and rounded back at the casings. Drive the nails into the floor, so that shrinkage of base will not lift the shoe.

Door and window stops are often mitered, but it is better to make the combination cope-and-butt joint illustrated.

When putting up picture mold, nail up opposite sides and cope the others between.

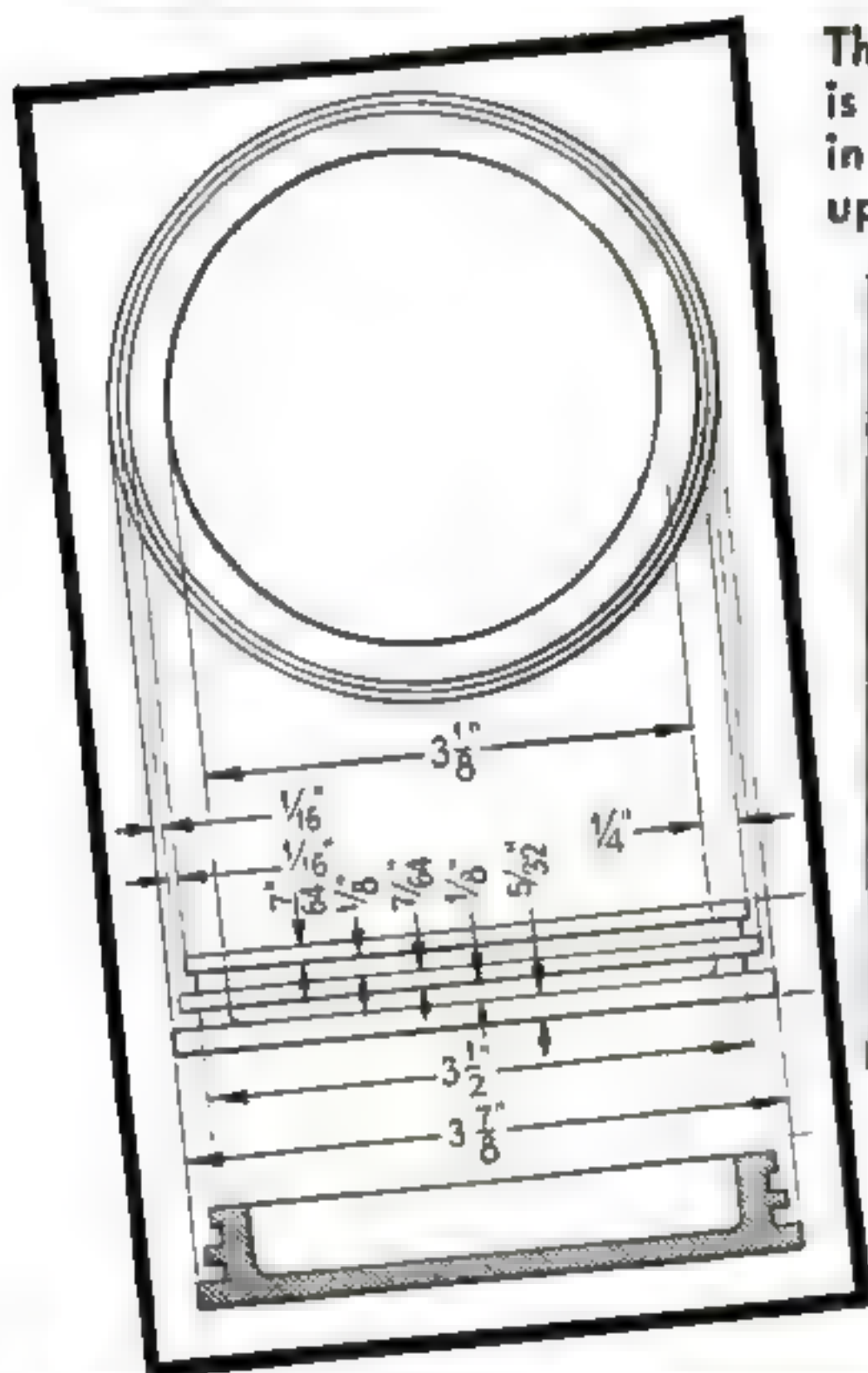
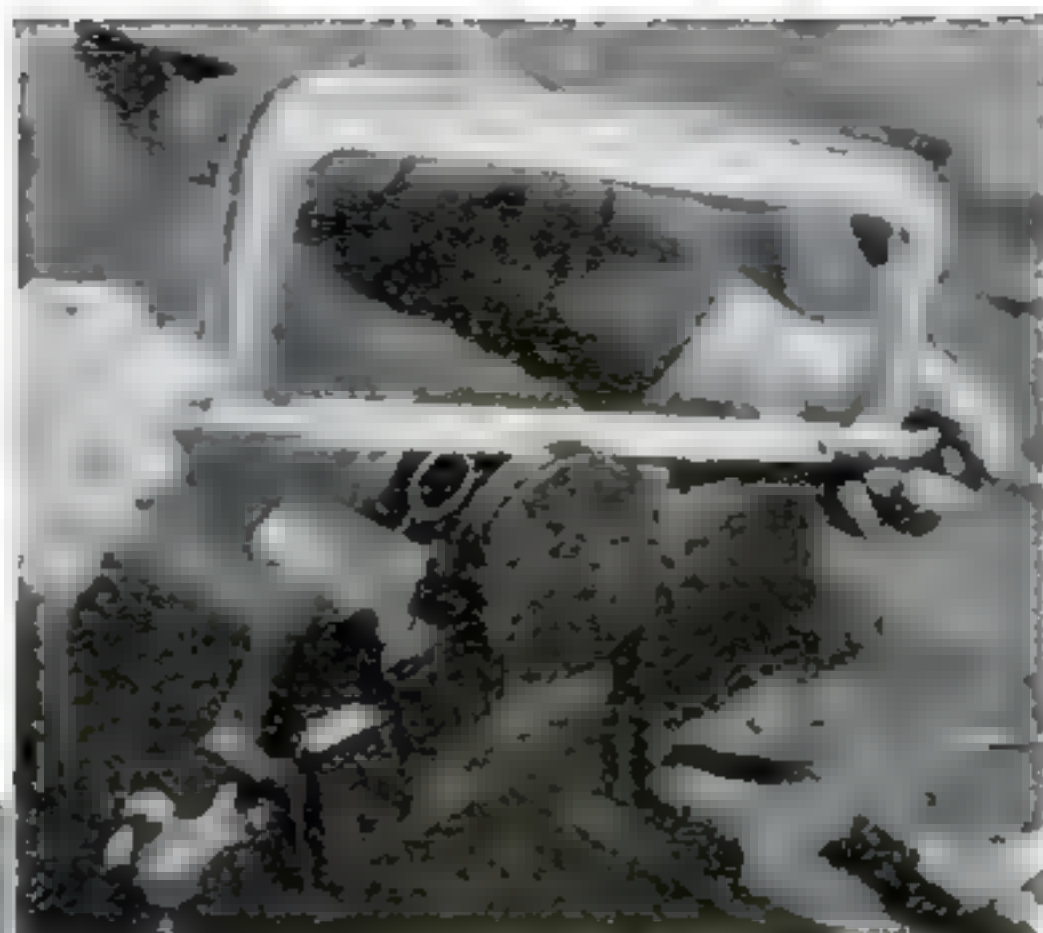
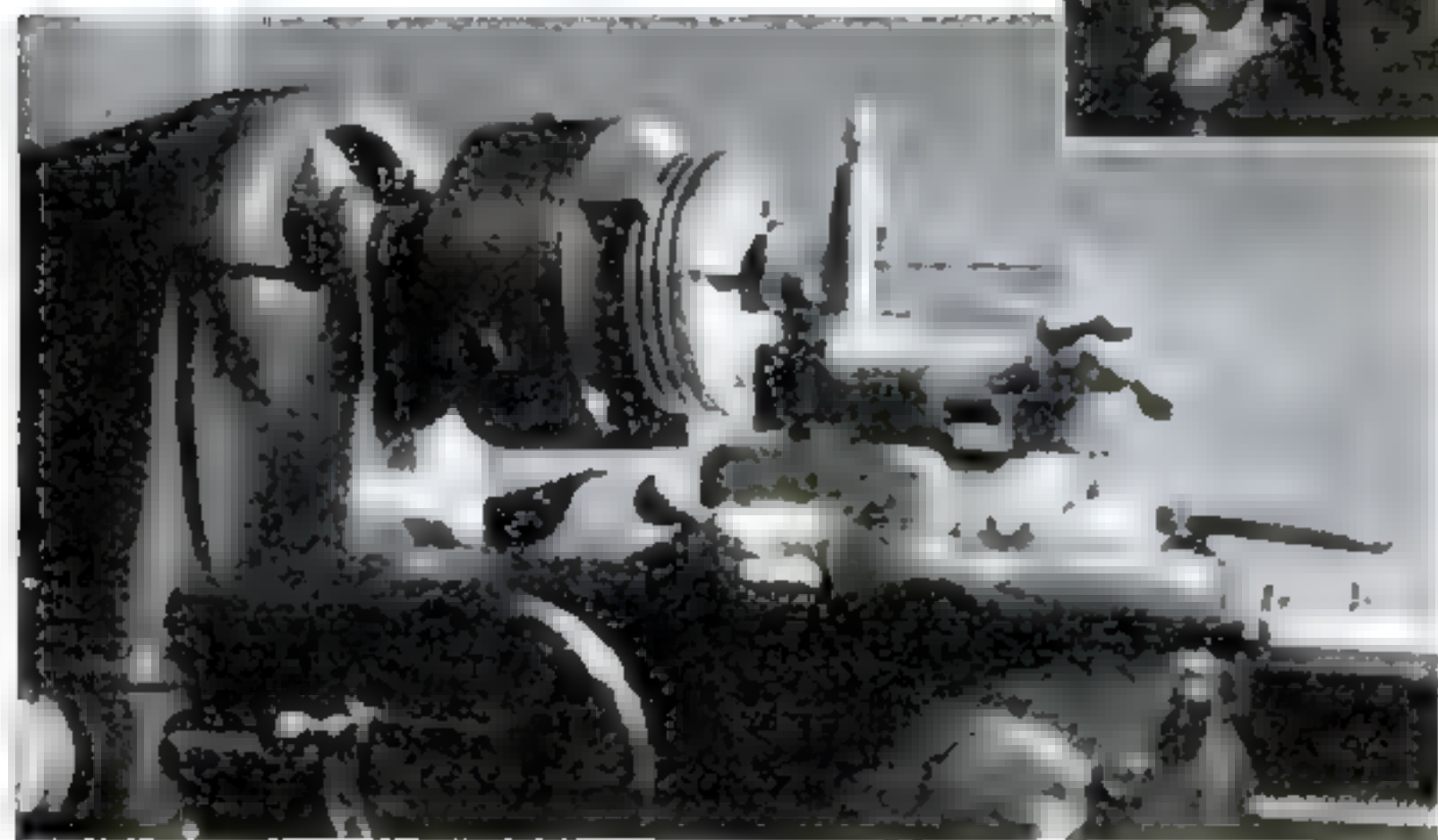


Using an ordinary pencil scriber, held horizontally, to scribe or mark a baseboard joint at corner

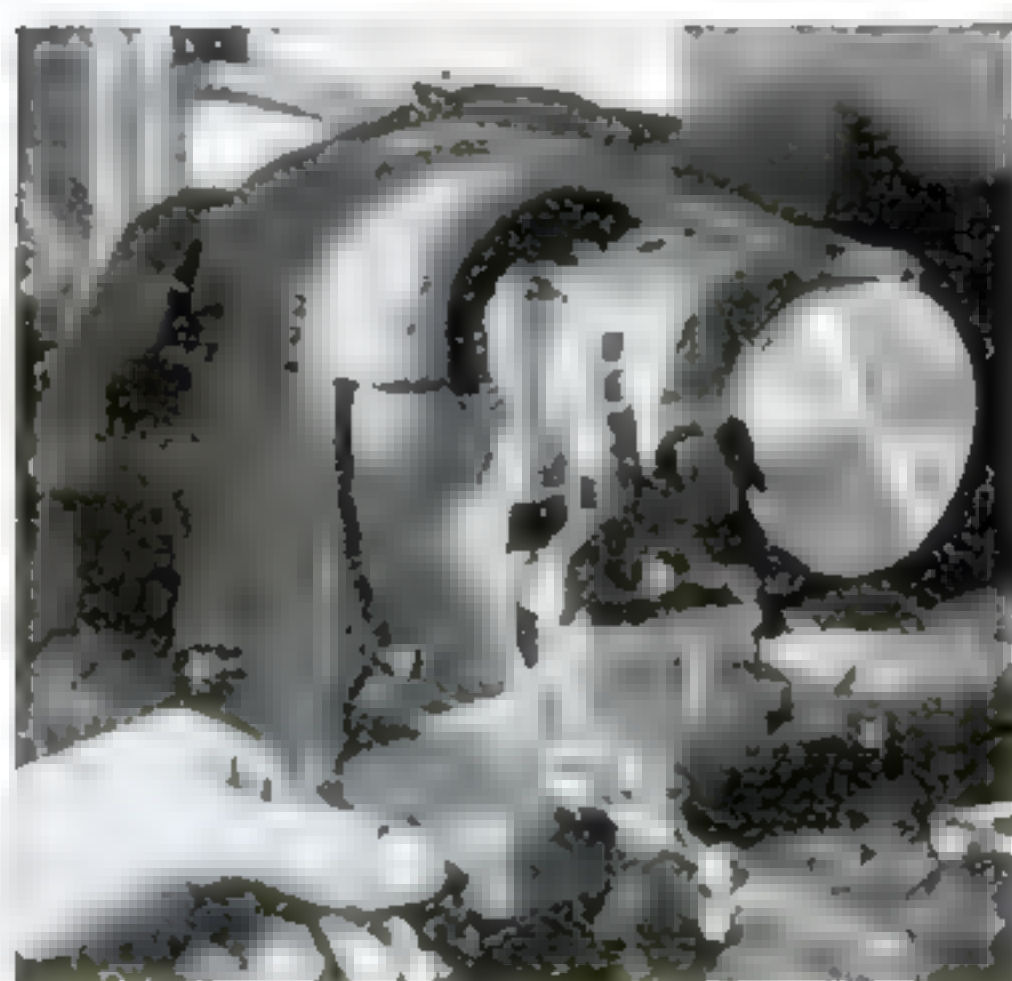


To aid in fitting the baseboard to a door casing, a "hook" or strip of wood slotted to fit the base is pressed against the casing edge and a pencil is run against the outer leg. Left, a double-hung window and how a mullion is fitted

AN OLD PISTON BECOMES A Modernistic Ash Tray



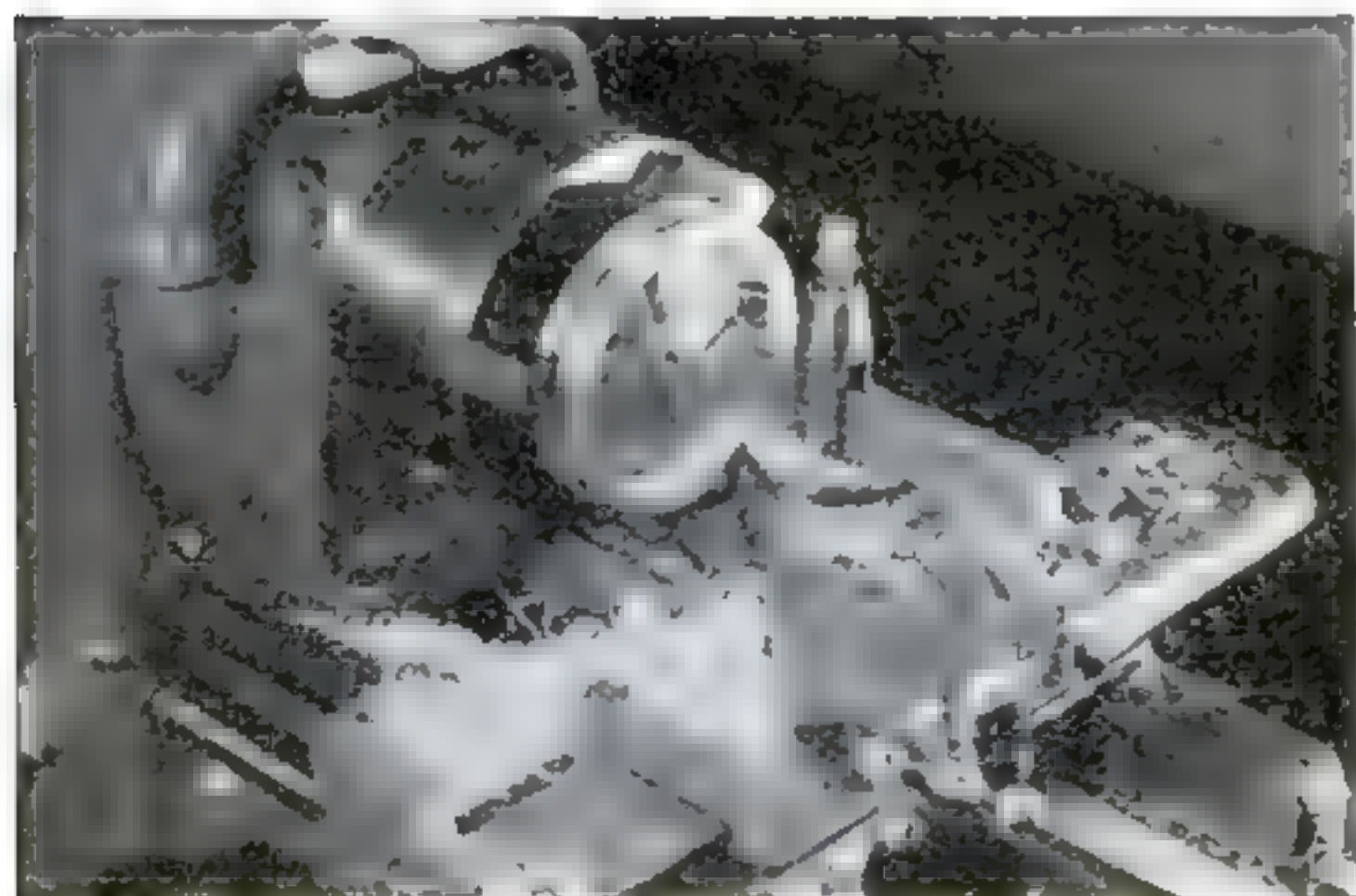
The head of the piston is sawed off, chucked in a lathe, and cleaned up with a facing tool



The grooves are trued up with a cutting-off tool, and the fins cut back as shown in the drawing

THOSE readers who are learning to use a metal-turning lathe will find few projects more interesting or useful than that old stand-by—making ash trays from discarded alloy auto-engine pistons. The tray illustrated was made from a model-A Ford piston.

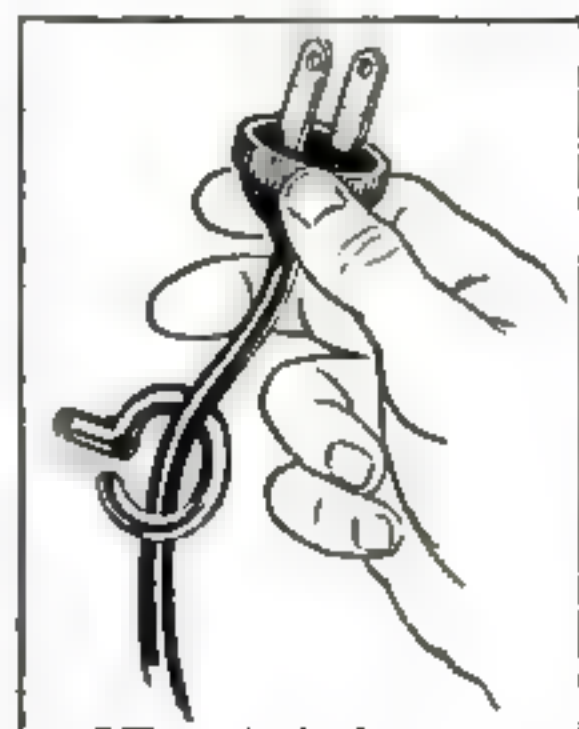
First, the piston head is sawed off. Then it is chucked in the lathe and cleaned up with a facing tool. The cut-off tool is used next for cleaning out the piston ring grooves, and the fins are cut back in steps to the dimensions given in the drawing. After the center brace of the piston has been cut away, the tray is hollowed out and highly polished.—C. WARREN WOODSON.



Finally the center brace is cut away and the tray hollowed out. Then the whole is polished bright

Hanging up Electric Cords

BY USING screw eyes with an open eye, it is possible to keep the cords of motors, lights, and various plug-in appliances used in the shop or darkroom from lying on the floor or becoming tangled on a table. Fasten the screw eyes to the wall near the outlet or in any convenient position, and insert each cord as shown as soon as the plug has been pulled out of the outlet.—RAY THUROW.



Danger

**HAROLD P. STRAND
TELLS HOW TO AVOID
FIRE HAZARDS FROM
IMPERFECT WIRING**

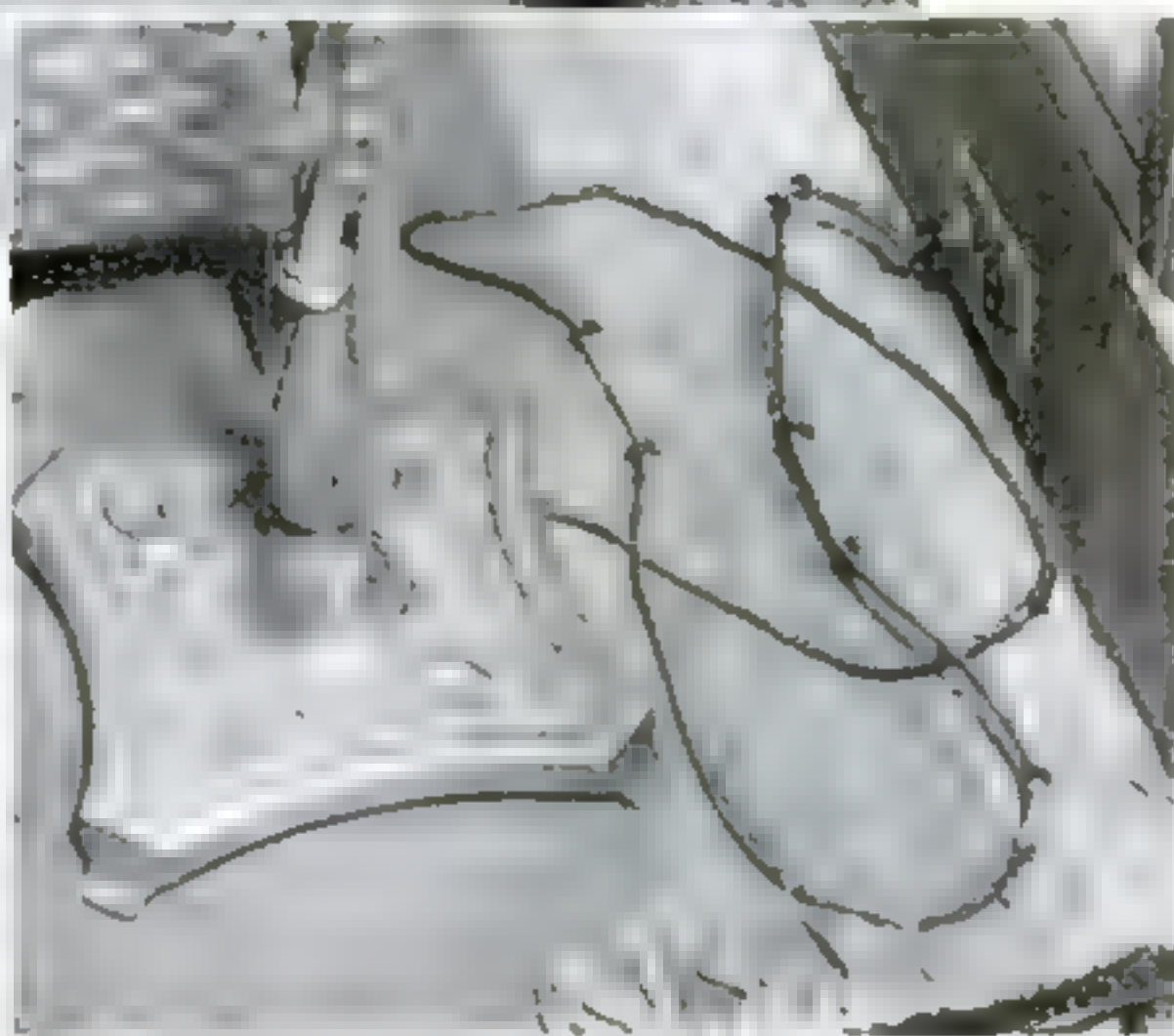
• • •



Where to plug the new lamp? This cozy corner needs a base outlet. Right, unnecessarily long cords soon wear badly and cause a real fire hazard

FIRE hazards exist in many homes because of defective or improperly used electric cords. When anyone drives a double tack across a silk-and-rubber insulated cord, he creates a fire hazard because the bare metal tack may cut into the insulation in time and cause a short circuit. The National Electrical Code book gives no authority to use cords in this way as permanent wiring. A cord should be strictly portable.

Here is exactly what the Code says in this connection (article 400, section 4003, 1937): "Flexible cord shall be used only for pendants, wiring of fixtures, connection of port-



able appliances, or as a part of approved stationary devices to prevent transmission of noise or vibration, or for plug and receptacle connections to facilitate interchange of devices."

If a cord is secured to a wall or other surface or tacked around a room, it is no longer portable, but fixed, and is being used as permanent equipment in place of BX or similar conductors.

Splicing cords should be avoided. Under no conditions is it permissible to piece out a too-short cord. Either obtain a new piece or make use of a cord connector. It is well when replacing any ordinary cord to use the new all-rubber variety. See that the underwriters' label is wrapped around it every few feet as a guarantee of approval.

A periodic check of all cords in the house every few months is about the best insurance against trouble. If the outer covering is worn off in places or the cord has become badly twisted in use, replace it. Also check the base of the lamp or appliance, where the cord enters, and the attachment plug. The insulation should be intact right up to the point of connection.

If of the rubber variety, cords up to 12' or 15' may be laid on the floor close to the base, but for any greater distances a properly wired base outlet should be installed.

In rooms that have no base outlets at all, a cord is sometimes run from the wires un-

in Electric Cords



Portable cords are not to be tacked to moldings as a substitute for permanent wiring. The cord in the kitchen at left is dangerously overloaded



der the canopy of the fixture in the center of the room to a point at the picture molding, then down the wall to a ten-cent surface outlet device. This is certainly a case to be outlawed. Sometimes there will be a multiple outlet of this type in the kitchen to supply a refrigerator, washer, electric iron, toaster, and various other appliances. One of the greatest hazards exists here because of the power consumed by many kitchen appliances, all placed on a cord when in reality a special circuit with extra heavy wiring should be installed.

The ordinary type cord contains two No. 18 wires, which are rated for 5 amperes (550 watts at 110 volts); and heating type

cord, such as asbestos insulated, is rated at 10 amperes when using it for portable heaters. See that the rating of the appliances, as taken from the name plate, does not exceed the size of the cord in use. Never use asbestos cord near water; it is not safe.

If an appliance is rated at more than 5 amperes and is of the nonheating type, or over 10 amperes of heating load, a larger size cord must be used for safety. The next size, No. 16, usually cares for any domestic portable appliance; it will safely carry 7 amperes in rubber and 15 amperes in heat-resisting insulation.

For example, an ironing mangle that draws 15 amperes (1,650 watts) should have a No. 16 asbestos-insulated cord or equivalent and should be plugged into an appliance circuit wired with No. 12 wire. The receptacle should have a rating of *at least* 15 amperes. The fuses may be of 20-ampere size.



Never splice a cord. When an extension is needed, attach the new piece by means of a cord connector

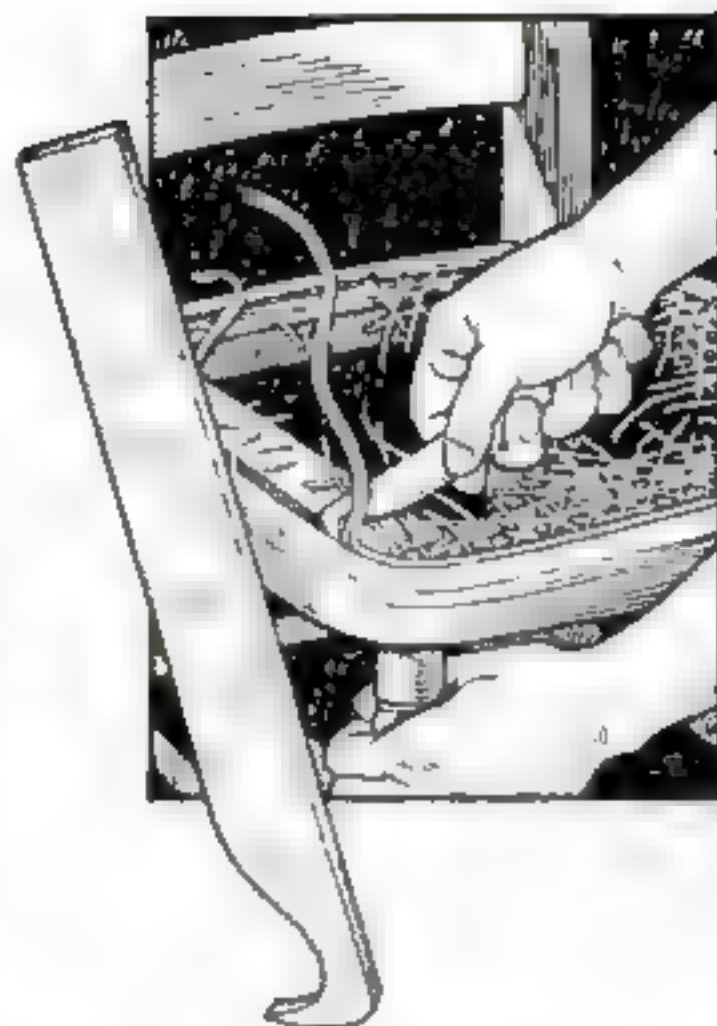


Inner Tube Leads Water from Wall

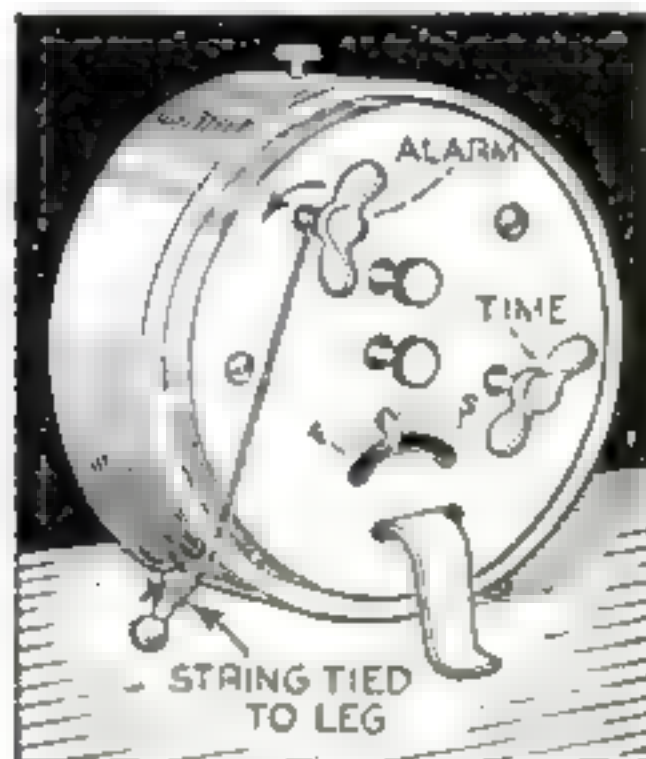
AN OLD inner tube, if cut in half and slipped over the end of a drain spout, will do much toward keeping water out of the basement and away from the house foundation during a heavy, long-continued rainstorm. A tube is easy to put on and take off, and it will carry the water from 8' to 10' away from the house. If the water comes down the drain with considerable force, a cord or wire may be needed to tie around the tube and hold it in place. Remove the inner tube when the storm is over.—THERON G. CADY.

Hooklike Scraper Aids Recaning

PREPARATORY to recaning a chair, the old spline can quickly be removed from its groove with a scraper ground from a flat file to the shape shown. The thickness is regulated by the ease with which the scraper will fit into the groove. You may find it convenient to have several sizes.—HARRY ROSENBERG.



String Shuts Off Alarm Quickly

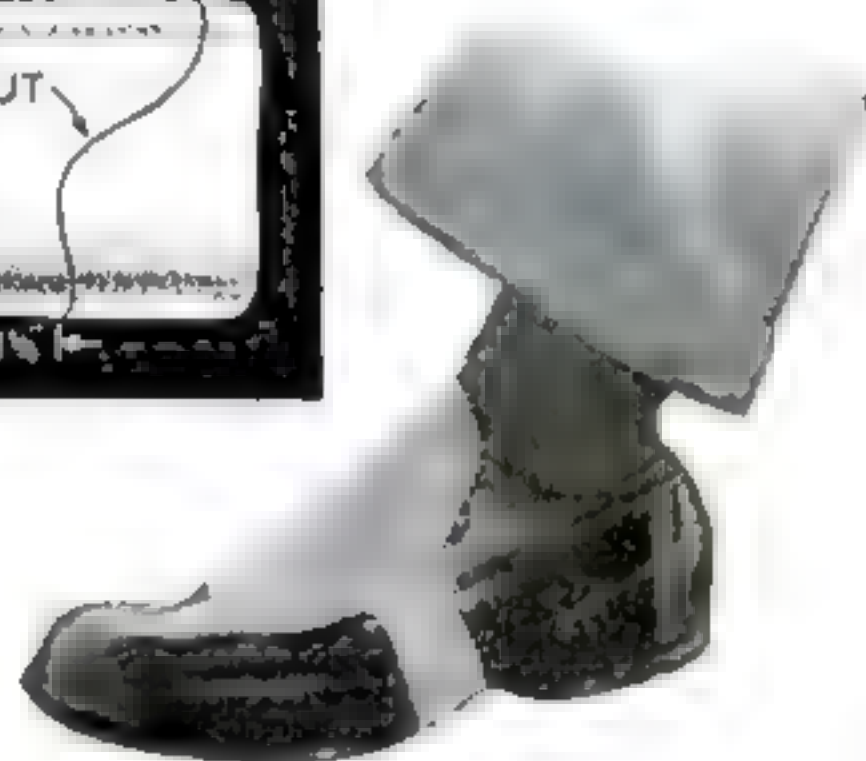
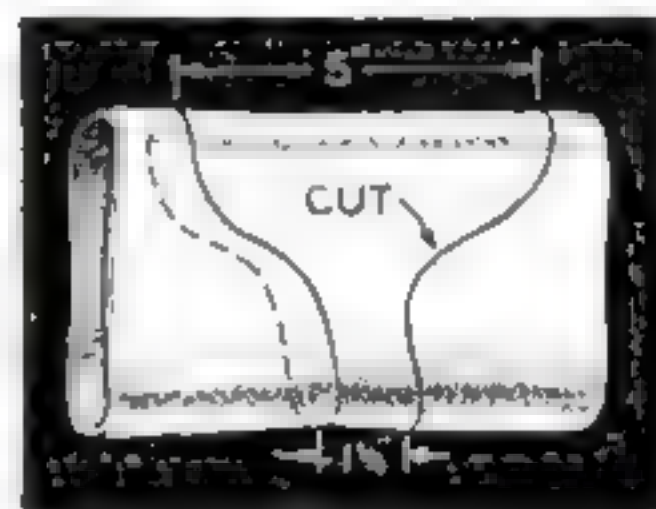


The cord is wound up as the alarm unwinds

WHEN it is desirable to cut off the alarm of an ordinary spring-wound alarm clock quickly, tie string to the alarm-winding key, wrap it around a turn or two in the direction indicated by the arrow, and tie the other end to one of the feet. The length of string determines the length of time the alarm will sound. The string is wound around the key when the alarm goes off and chokes it off.—KENNETH SMITH.

Guards Prevent Loss of Rubbers

IN VERY rainy weather or when working in deep snow, pieces cut from an old inner tube as shown will help keep the feet dry. They also prevent the loss of rubbers in snow or mud. Dimensions may be changed if necessary.—CHARLES BATTY.



New Home Workshop Index Lists Every Article of 1938

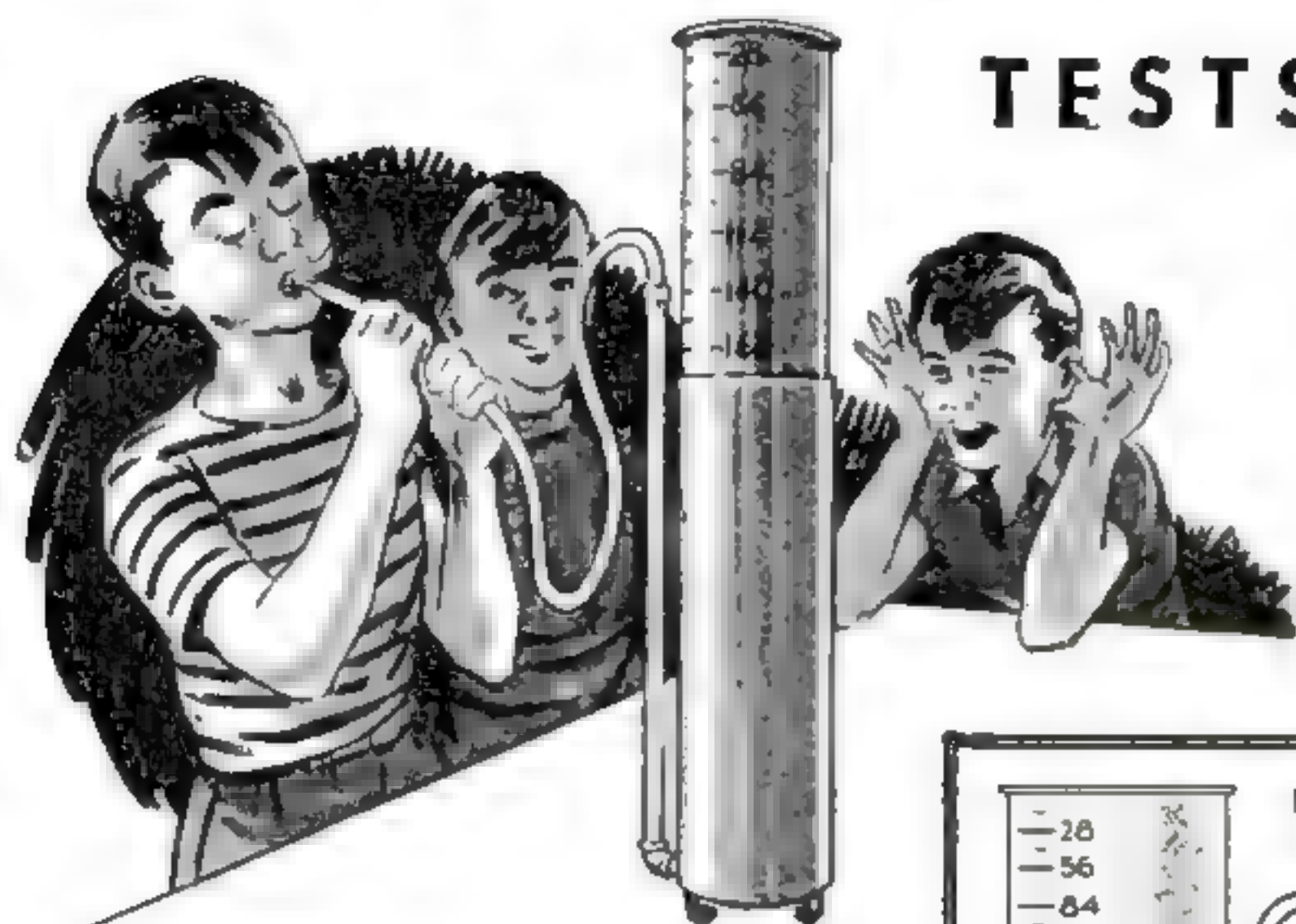
WITH the Home Workshop Department enlarged to nearly twice its former size, you will need the Home Workshop Annual Index more than ever before. During the past year nearly 600 pages were devoted to the home workshop and to such hobbies as radio, microscopy, chemistry, and astronomy. The 1938 edition of the Index—just published—lists every item. Get it and you will save yourself hours of searching through old magazines for needed information to help you in your work.

You do not have to fill out a coupon or write a letter. Merely address Popular Science Home Workshop Index, 353 Fourth Avenue, New York, and inclose ten cents together with a large return envelope addressed to yourself. There are still a few copies of the 1937 Index available at the same nominal price of ten cents. Send twenty cents if you wish the Indexes for both years.



Stovepipe Spirometer

TESTS LUNG CAPACITY



Step up, gents, and see how good your lungs are! This amusing device registers in cubic inches

A LUNG tester or spirometer is not only an entertaining device, but it also serves a useful purpose by encouraging boys to develop their chests if below normal. When they find some of their friends have much greater lung capacity, they will be more inclined to do regular deep-breathing exercises.

From a plumber or tinsmith, get a 20" length of standard 6" galvanized-iron stovepipe, and either make or have made a similar pipe 5 $\frac{7}{8}$ " in diameter and 20" long to fit inside it. A simple lap joint, well soldered, will do nicely for this pipe, and a piece of 22-gauge iron 19" by 20" is large enough.

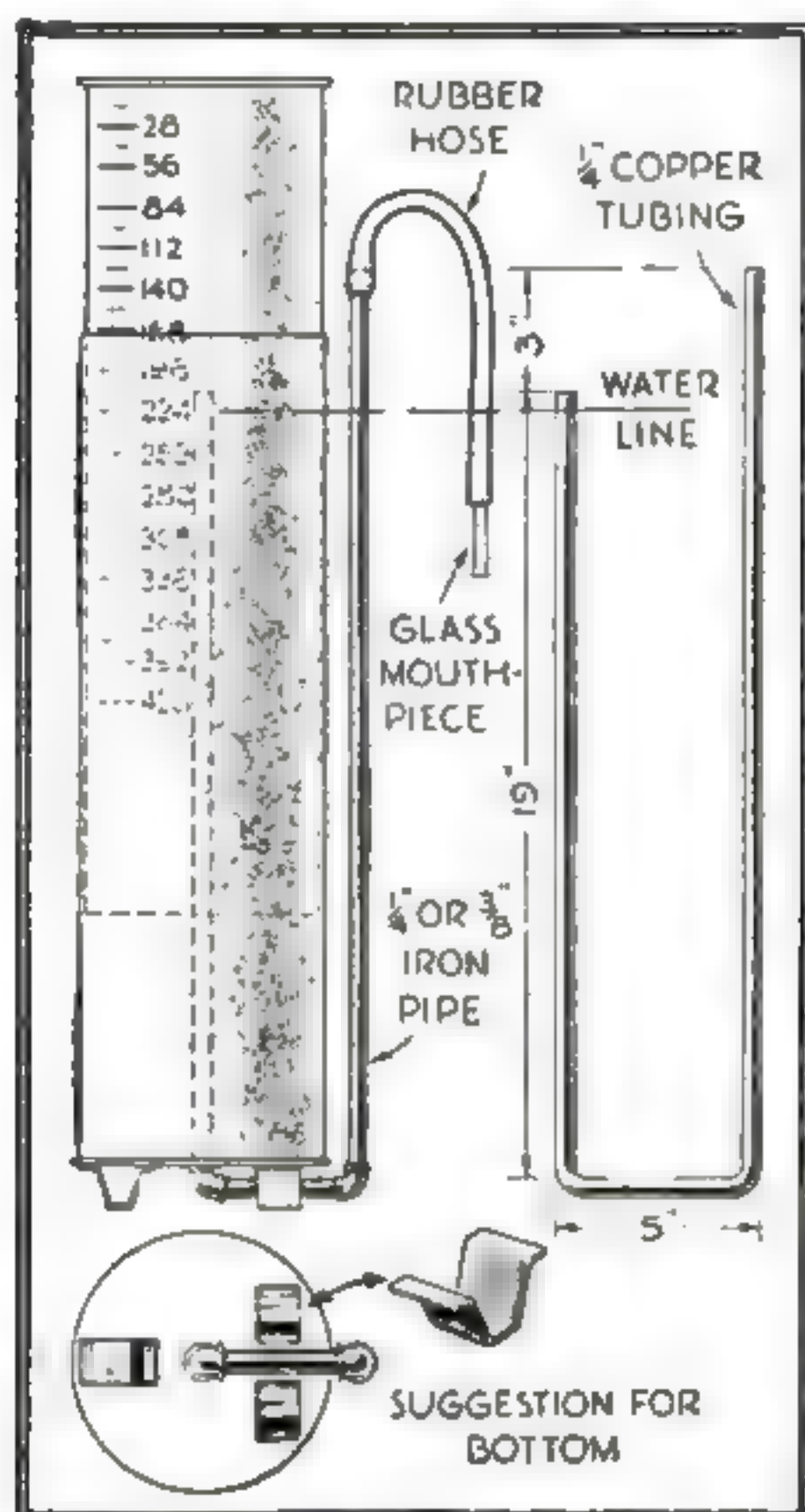
Cut two 6 $\frac{1}{4}$ " disks of the same material and solder one on one end of each cylinder.

Measure inch spaces on the outside of the smaller cylinder and mark the cubic contents. It is not necessary to figure this accurately; 28 cubic inches will do as a rough approximation for each inch of height.

Either bend $\frac{1}{4}$ " copper tubing as shown at the right of the accompanying drawing, or make a similar piece by using $\frac{1}{4}$ " or $\frac{3}{8}$ " black iron pipe and two elbows as indicated in the assembly drawing. Pierce the bottom of the larger tank for the tubing or pipe, insert the shorter end as shown, and solder the piece firmly in place. Bend three galvanized-iron feet and solder them to the bottom of the outer container. Fit a length of rubber hose and a glass mouthpiece to the outer end of the tubing or pipe. Then fill the larger section of the tank with water to the point marked "water line." Insert the smaller section within the larger, letting the air pass out through the hose.

To use, fill the lungs with air and blow evenly and steadily; then kink the hose to hold the pressure until

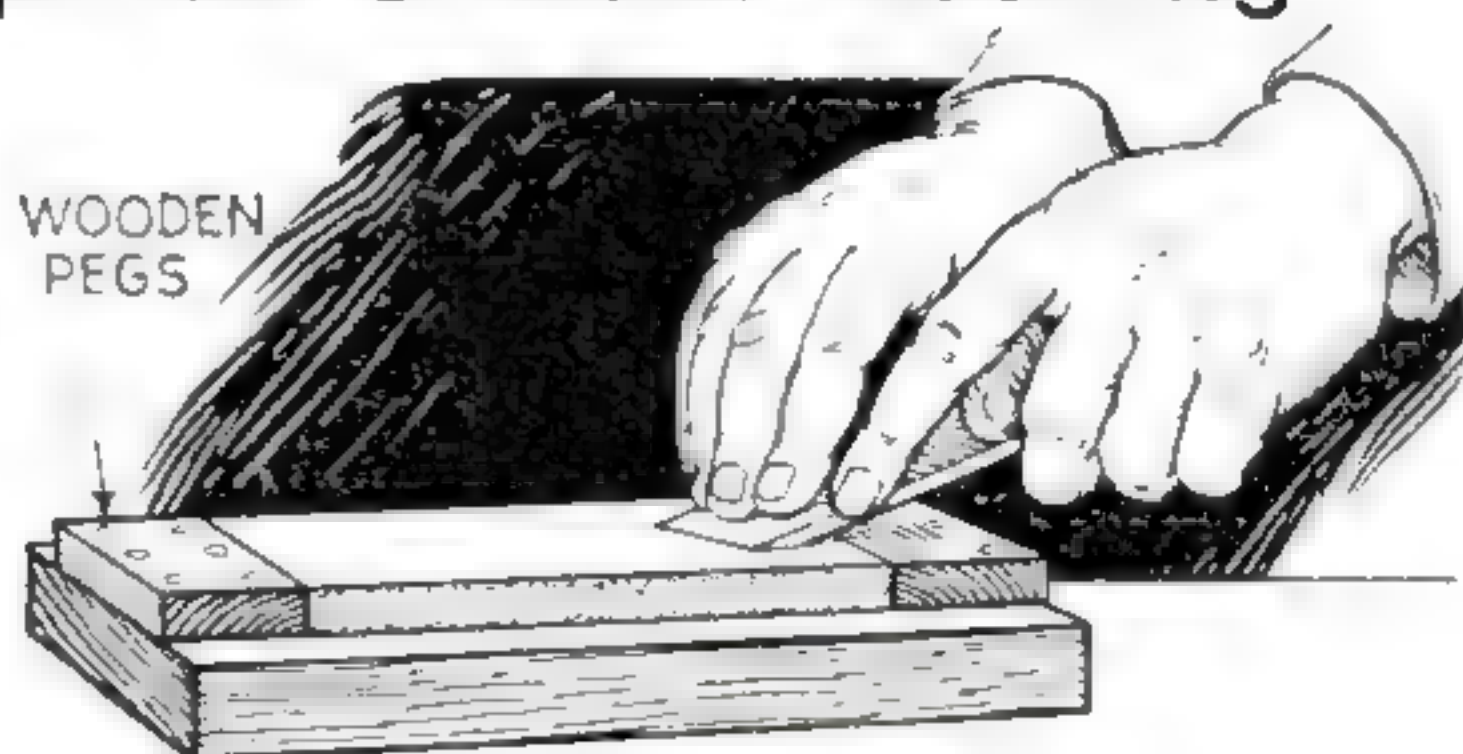
you have noted how far the inner container has been raised and taken the reading in cubic inches. The average individual should be able to blow up to about 280 cubic inches, experiments indicate.—R. H. JENKINS.



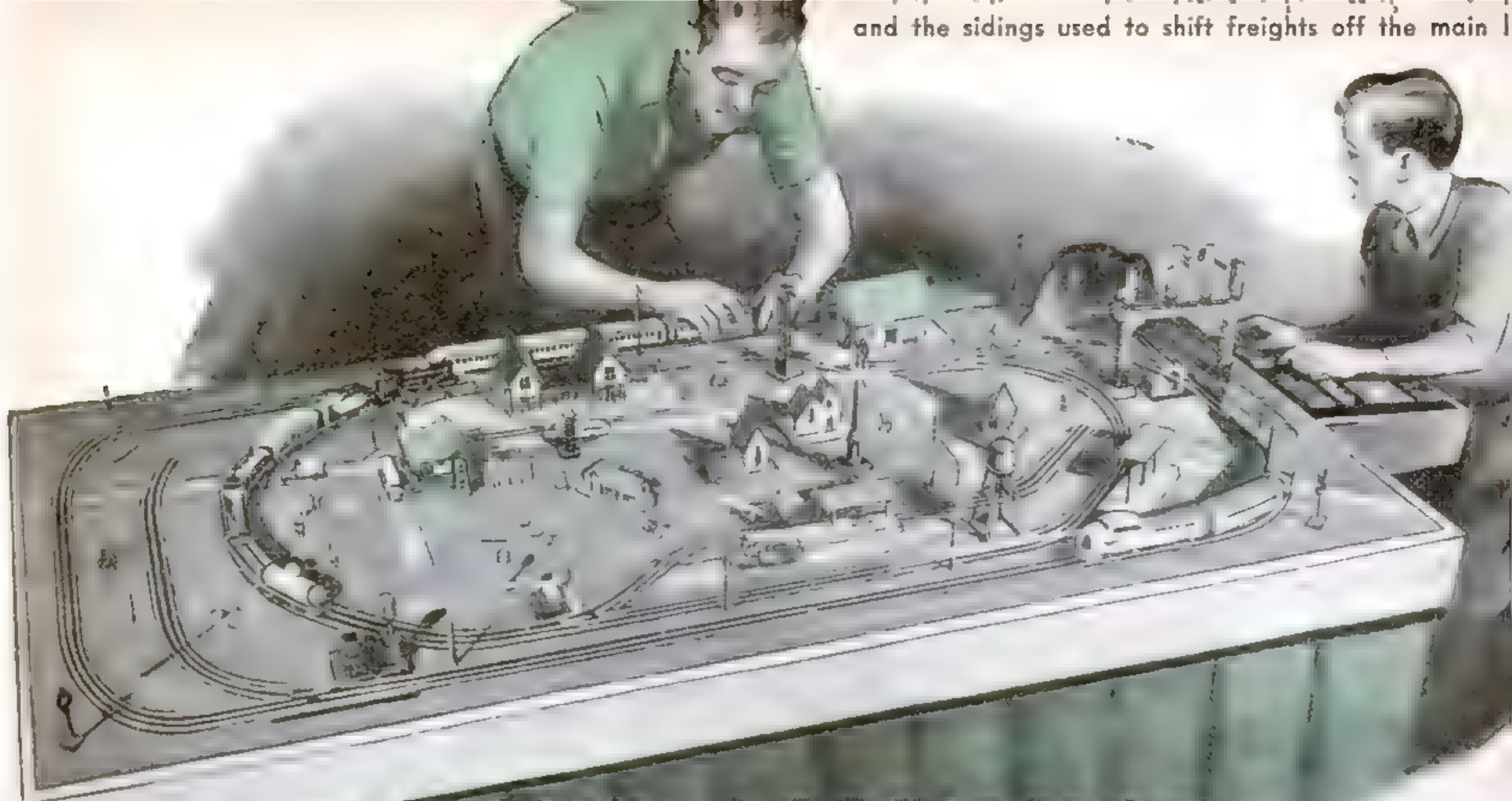
Hardwood End Blocks Improve Oilstone Mounting

TO ENABLE the whole length of an ordinary rectangular oilstone to be used without danger of overrunning and striking the edge of the tool against the end of the stone, a special mounting may be provided as shown at the right.

The stone is set into a wooden block or in a heavy box in the usual way, and two small maple blocks are then fastened at the ends flush with the top of the stone. Use wooden shoe pegs or dowels to hold the small blocks in place.—ALFRED L. FITCH.



The tool will not overrun the stone and strike the edge if wooden blocks are placed flush at each end



EASILY ASSEMBLED Model Railway Layout

MAKES POSSIBLE MANY REALISTIC TRAIN MOVEMENT

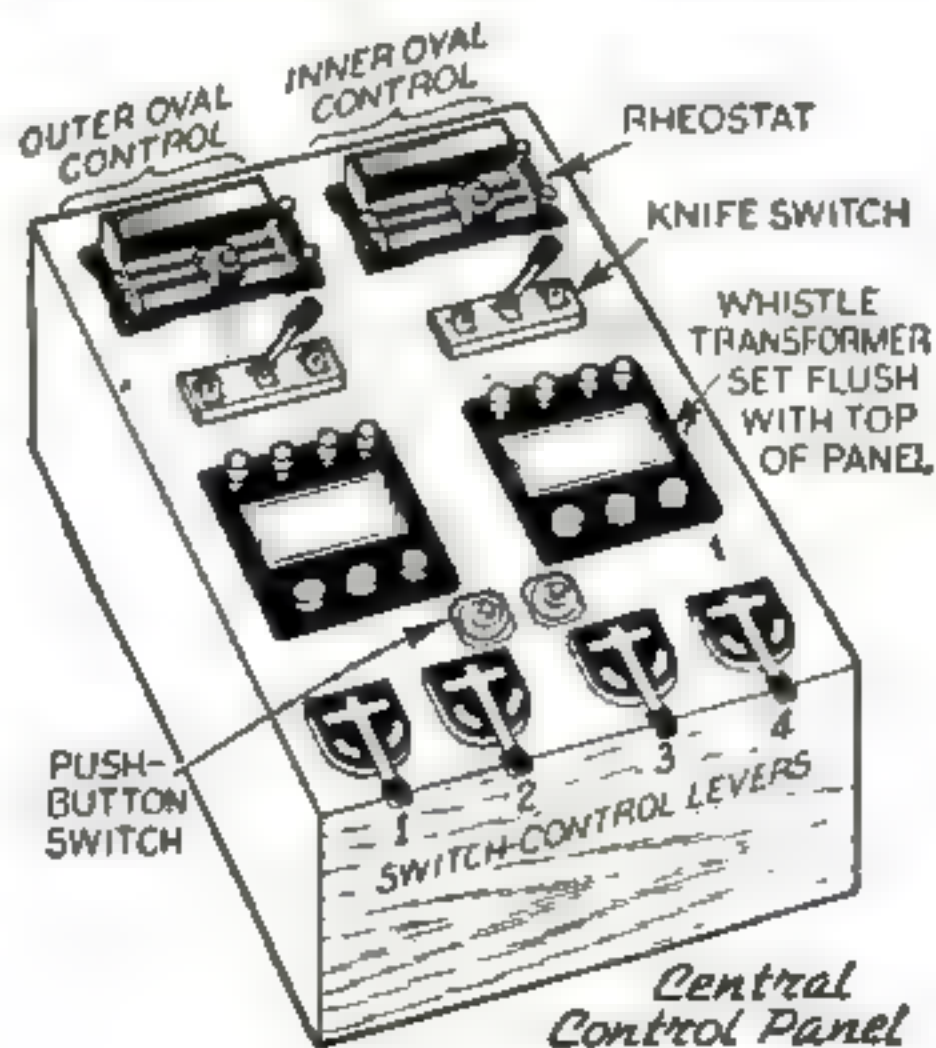
THIS model train layout is arranged to enable two or three trains to be operated at the same time, and with "O" gauge track it will fit on a platform 4½' by 10' (see P.S.M., Dec. '37, p. 99 for the construction of a convenient two-piece portable platform of this size). The layout consists of two separate circuits, one for the inner oval and one for the outer.

Sidings are provided for each oval, and a switch of the push-button type is connected in the line to these sidings to control any trains on these sections. With switches open in the normal position, trains on the sidings will remain stationary while those on the main line are moving. The sidings are arranged to load freights or shift them off the main line so as to give the right of way to expresses. To move trains out onto the main line, the button must be depressed. The switches are also supplied with separate current for smoother operation; and while not shown, the usual three wires connect the contacts on the switch to the control lever on the panel.

By using the single-pole, double-throw switch shown in the wiring diagram to step up the voltage, two trains will run at the same time on each oval. In this case, however, it will be necessary to load the faster locomotive with strips of lead to keep both trains running at the same speed and avoid rear-end collisions. When the higher voltage is on, it is not advisable to blow the whistle as it may burn out the whistle transformer.

As two transformers are used, it will be

Sketches of main switchboard and various track units needed



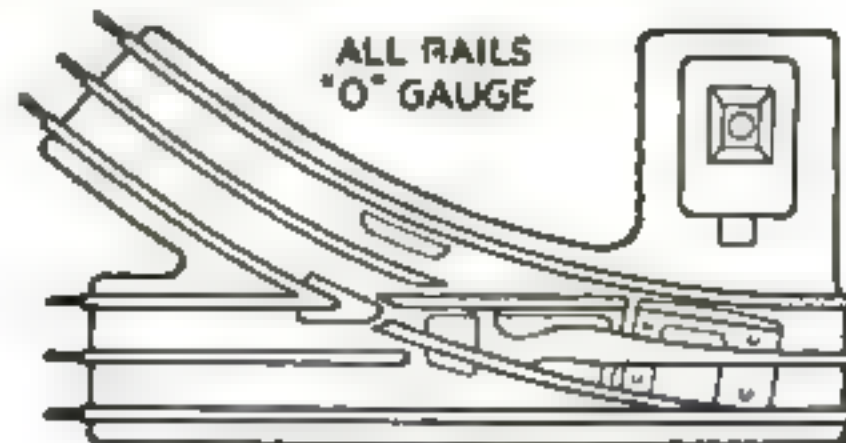
Required Rail for Track Layout



22 CURVED PIECES



33 STRAIGHT PIECES



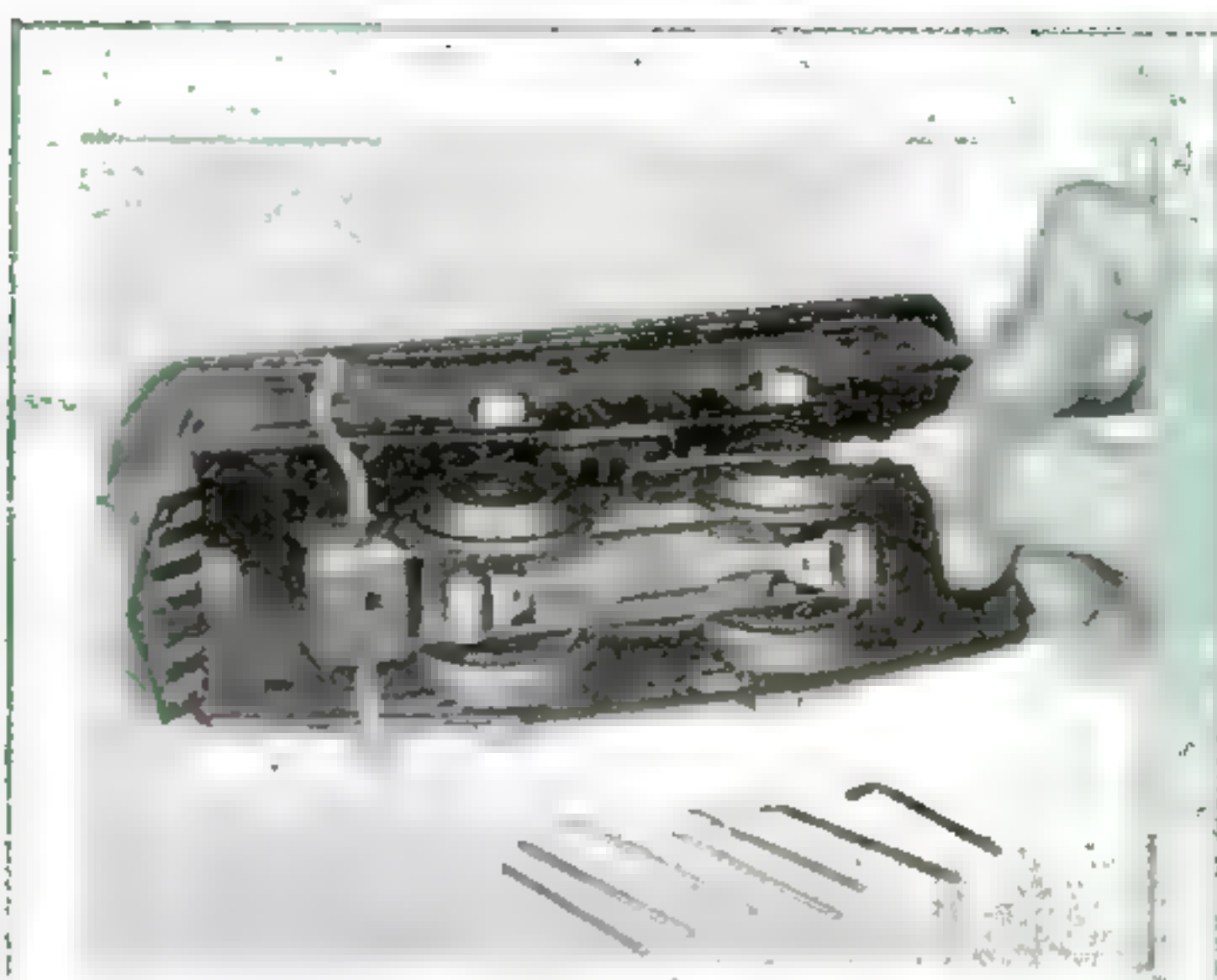
4 SWITCHES (2 LEFT AND 2 RIGHT)

By C. ELMER BLACK

necessary to place insulating pins (short lengths of match sticks will answer) in the tracks at point A where the circuits meet so that all three rails are insulated to separate the voltages from each transformer. A train passing over this point will momentarily connect both transformers in series, and if a circuit breaker is in the circuit, hold the breaker arm up in place with a rubber band under a slight tension. The increased voltage under this condition will not harm the locomotive motor unless the train is permitted to remain on this spot for a protracted period. The other insulating pins must be placed exactly as indicated.

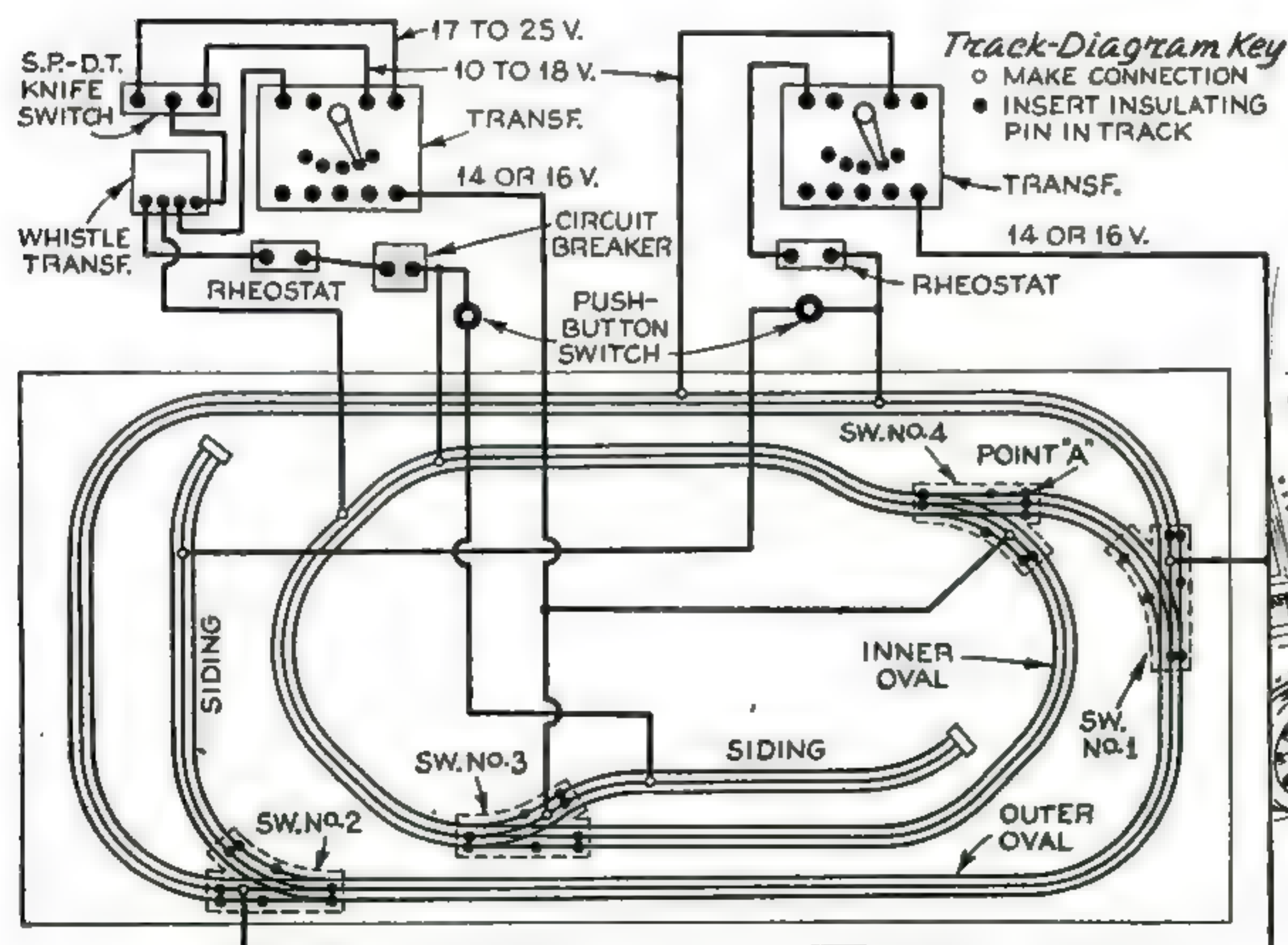
The transformer at the right of the wiring diagram is connected to the outer oval with only essential connections shown. When a whistle transformer and a circuit breaker are used, wire the layout as shown on the left side, which in the diagram is connected to the inner oval. Obviously both ovals can be wired either way.

By using distant-control locomotives and switches, and operating from a central control panel, many train movements are possible with this layout. For example, an express can be run from a station on the outer oval to a station on the inner, any locals or freights that are on the main line being side-tracked until the express passes. Or, by keeping switches Nos. 1 and 2 closed, trains can be operated continuously on each oval.

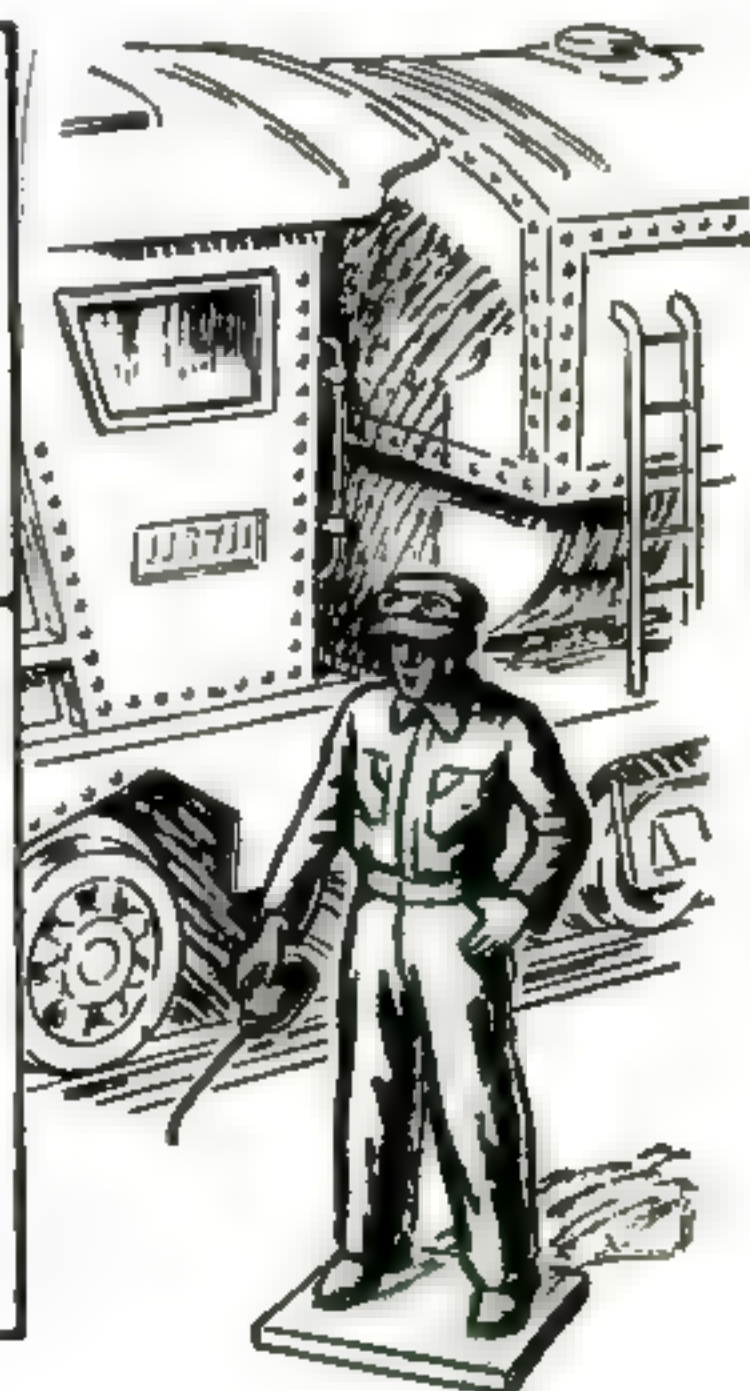


Tools for Work on Models

FOR work on model railway locomotives and equipment and for other model making and very fine work in the shop or laboratory, it is desirable to have a set of what I call "micro-tools" and a pin vise to hold them. The pin vise costs only a few cents, and the tools may be made from bicycle spokes or steel knitting needles. The wire is heated red hot and bent or hammered to shape, or ground on an emery wheel. It is then retempered by being heated red hot and plunged into water. Tools of this type are useful for getting into places where ordinary tools cannot conveniently reach.—R. W.

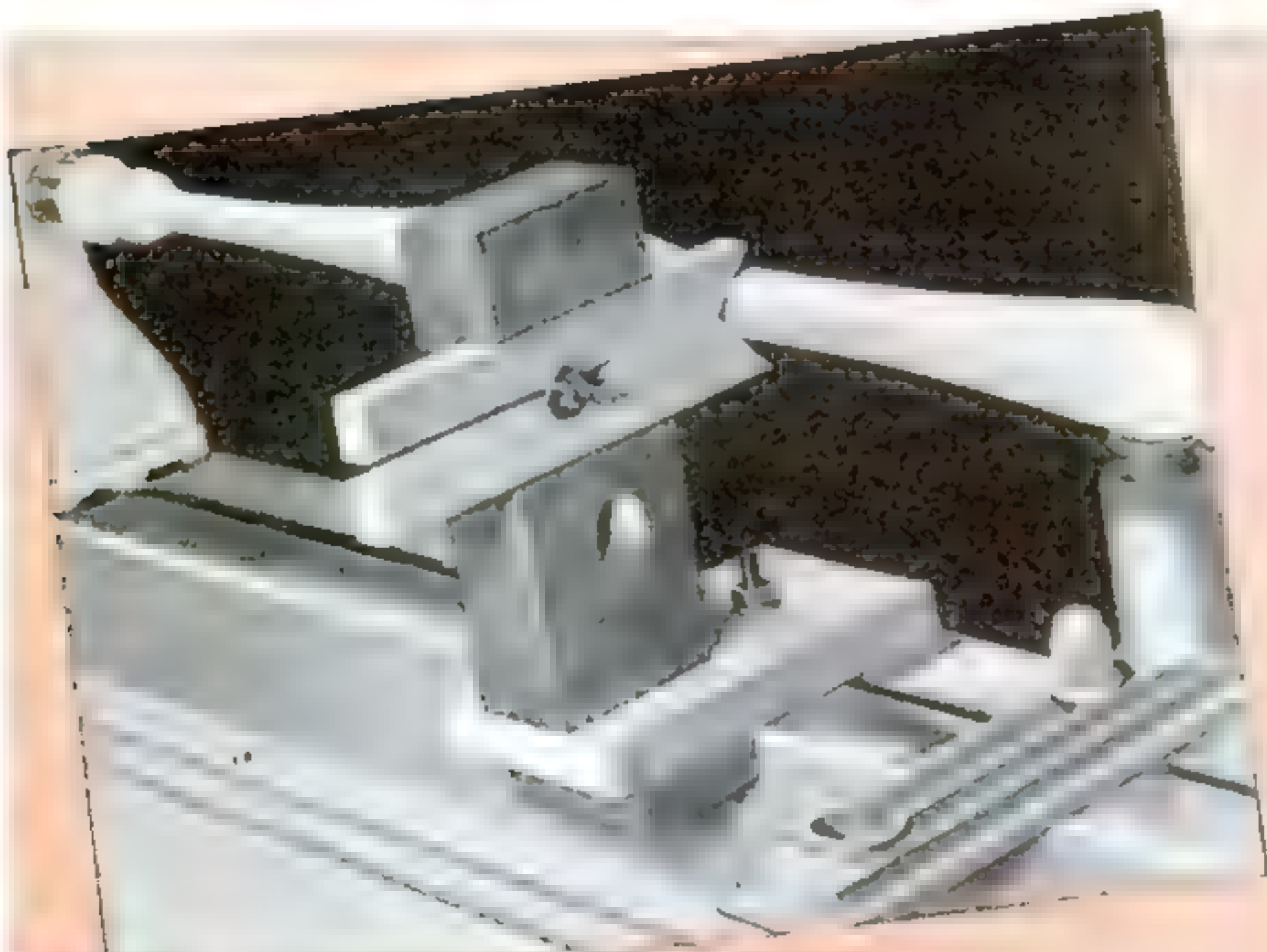


The essential connections. Both ovals can, of course, be wired in either of the two ways shown



Long, Slim Furniture

SMOOTHLY MADE WITH AID OF



LONG, slim, well-proportioned turnings are pleasing to the eye, but difficult to make because the wood has a tendency to vibrate. This vibration may be checked by the use of an adjustable back rest or back stick—a piece of wood with a V-notch so mounted that it may be fastened to the lathe bed or on the back of the tool-rest holder. The latter type is well suited for the thinner turnings and has the advantage of always being nearly opposite the cutting tool.

The spot where the back rest is to be applied may be turned by supporting the stock at the back with the fingers of the left hand to prevent the work from springing away from the tool. The notch of the back rest is then adjusted against this spot with a slight pressure. The burning produced on the work by the friction will disappear when the spindle is sanded.

By
**HOWARD R.
HEYDORF**



The adjustable back stick fits in a groove in an upright block fastened to the lathe bed. This rest is placed near the center of the turning and is not moved

Here the back rest is mounted at rear of the tool-post base and is moved with the tool rest so that it is always just behind the tool

After being cut square, the stock is set between centers, the lathe run at high speed, and the center of the spindle turned smooth as a bearing for the back rest. The left hand applies pressure behind the turning to prevent vibration



Turnings

SIMPLE FIXTURES

Using homemade extension bed and steady rest for a long turning. First about one half the spindle is turned; then it is reversed so the other end may be completed



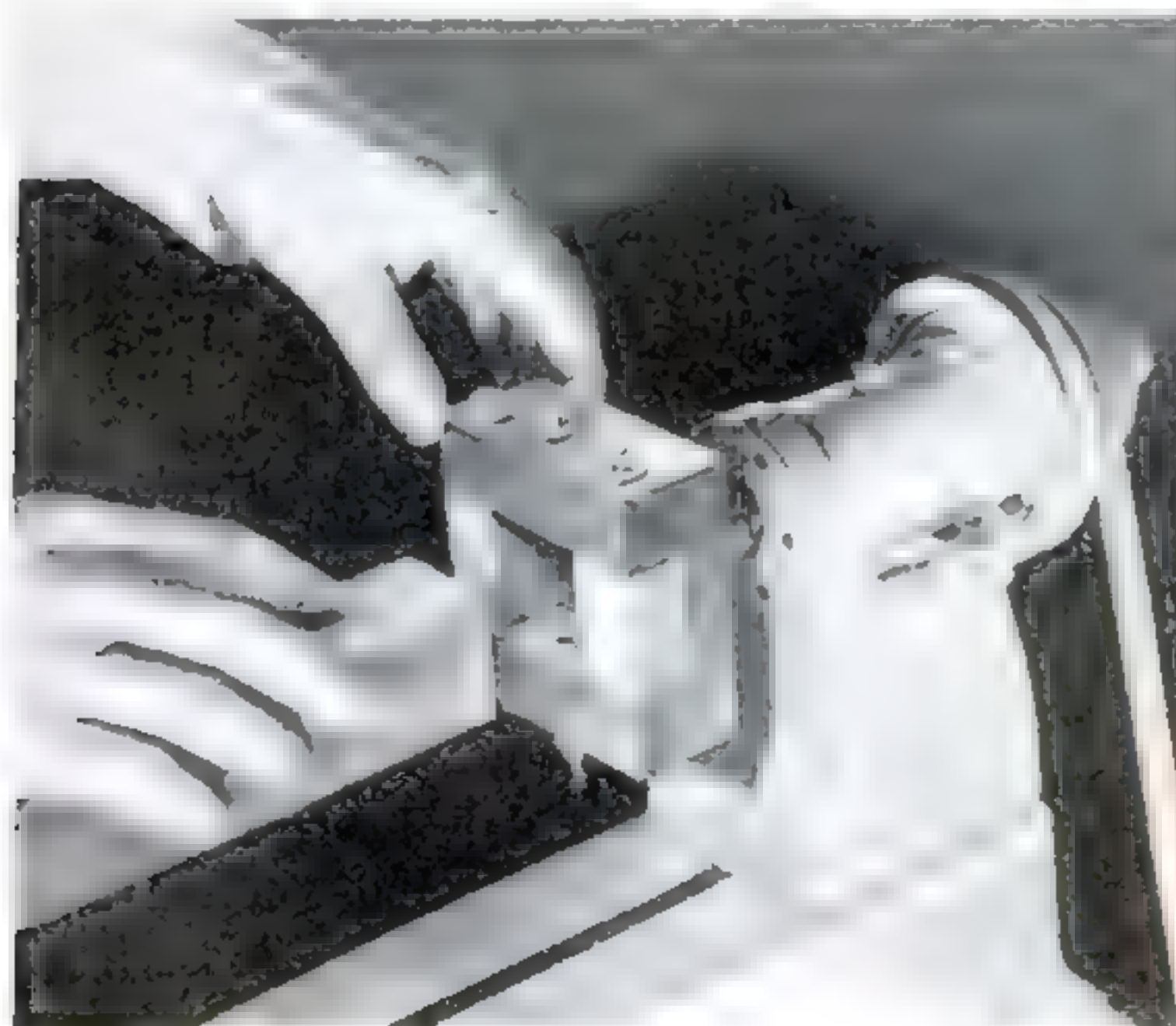
For long spindles, it is well to equip the lathe with a square chuck. Fit the chuck with set screws to hold the work securely.

When the work exceeds the length of the lathe, a bed extension may be constructed from heavy wood and the regular dead center used. Then, to prevent the turning from whipping, a steady rest is needed. The home-made one shown is of the conventional type, but it also has a square rest combined with it, the purpose of which is to prevent vibration while the turning square is being prepared for the steady rest. The square rest is merely a piece of wood with a round hole in

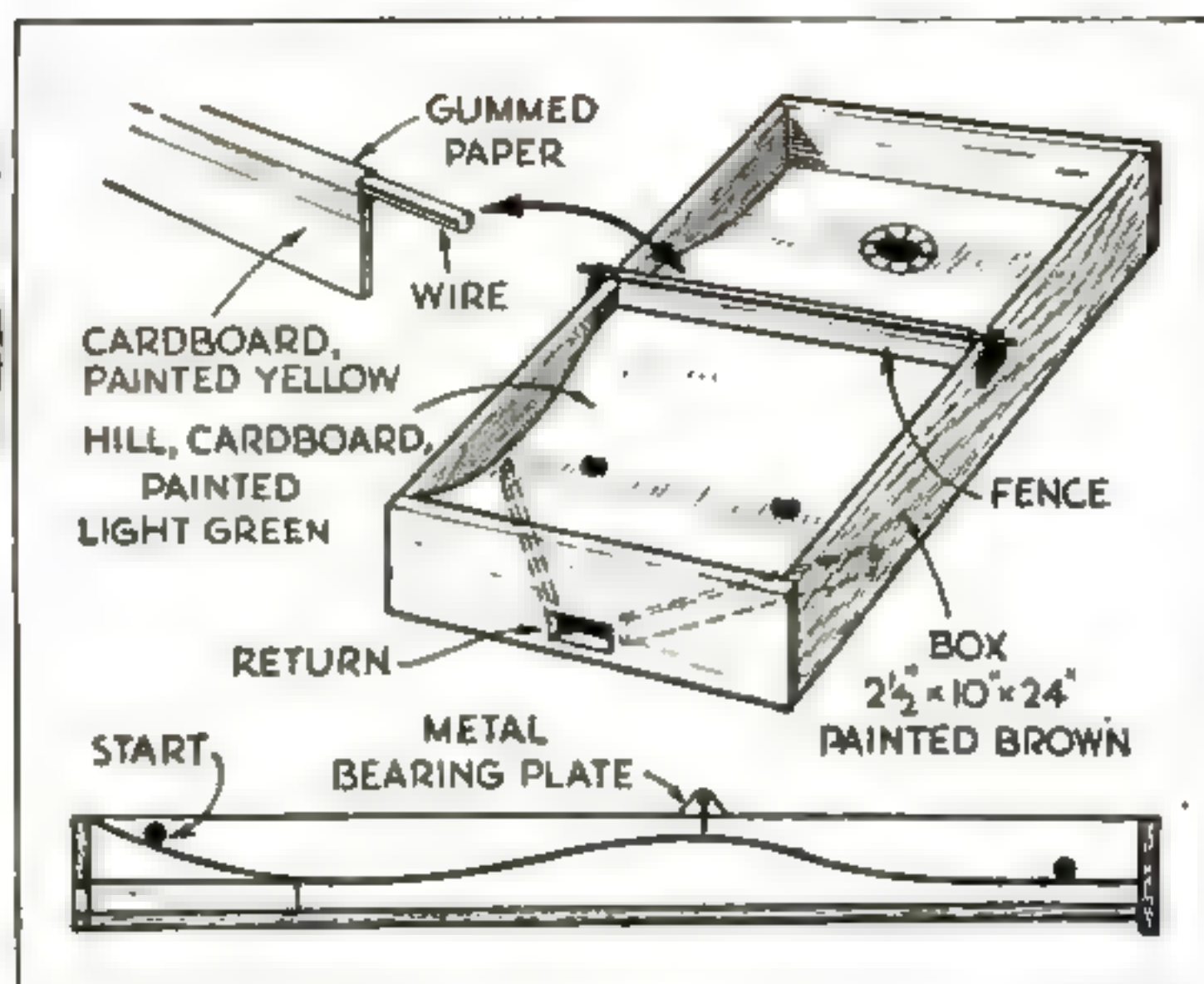
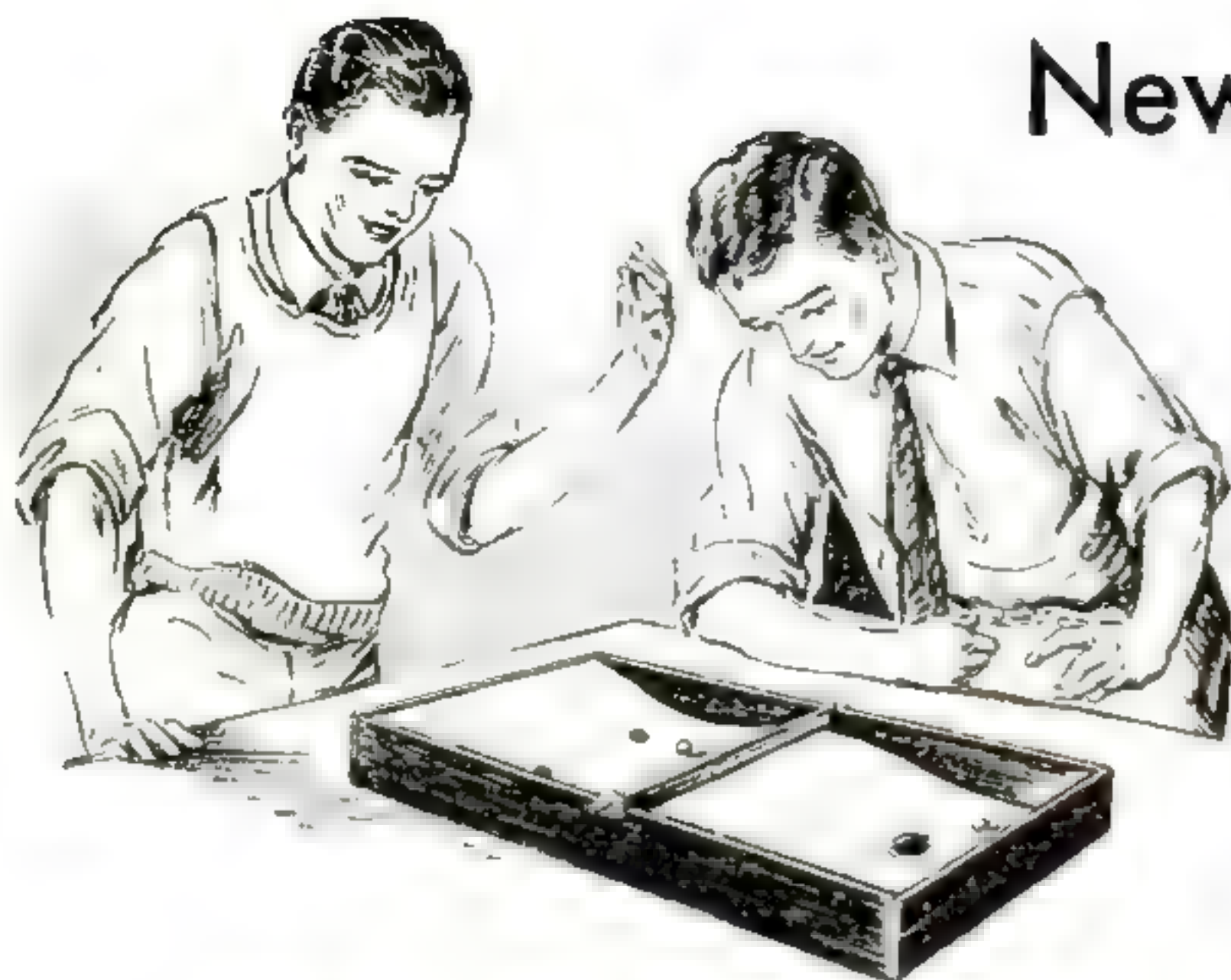
which the stock may revolve freely but not loosely, and it is removed when the stock has been turned down so the regular steady rest may be used. To insure true turning, the shoes of the steady rest should be adjusted so the turning is in a perfectly straight line.



Left, square chuck with two set screws to hold the stock. Above, the square rest in use. The edges of the stock to be turned are planed off slightly so as to give a better bearing surface

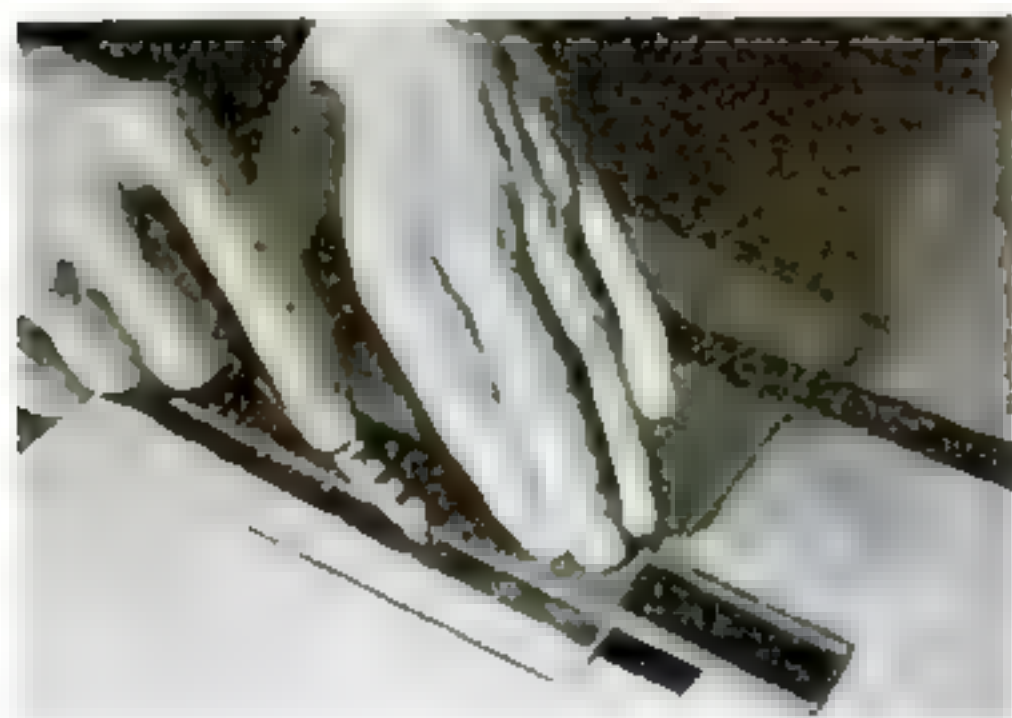


New Rolling-Ball Game "Over the Hill"



THE object of this game is to start a steel ball or marble anywhere on the incline and let it roll, without pushing, down the incline and up the hill until it just touches the fence. It should then roll back again into one of the woodchuck holes to score one point. If, however, the ball rolls into the hole without first touching the fence, it counts nothing. Should the ball roll past the pivoted fence and on over the hill, it counts

nothing. When the ball falls into the well on the far side, the player must forfeit one count. There are three rolls to one play, and ten points to the game. Any available wood can be used for making the box.—D.W.C.



Tape Holds Glass for Cutting

WHEN small pieces of glass have to be cut, they may be prevented from slipping by placing two or three strips of ordinary friction (tire) tape under the glass, one strip being directly under the cutting line as shown. Another strip of tape may be stuck on the underside of the straightedge, and the ends of the tape bent back over the top. More accurate cutting may be done, especially by amateurs, when these precautions are taken.—J.C.M.

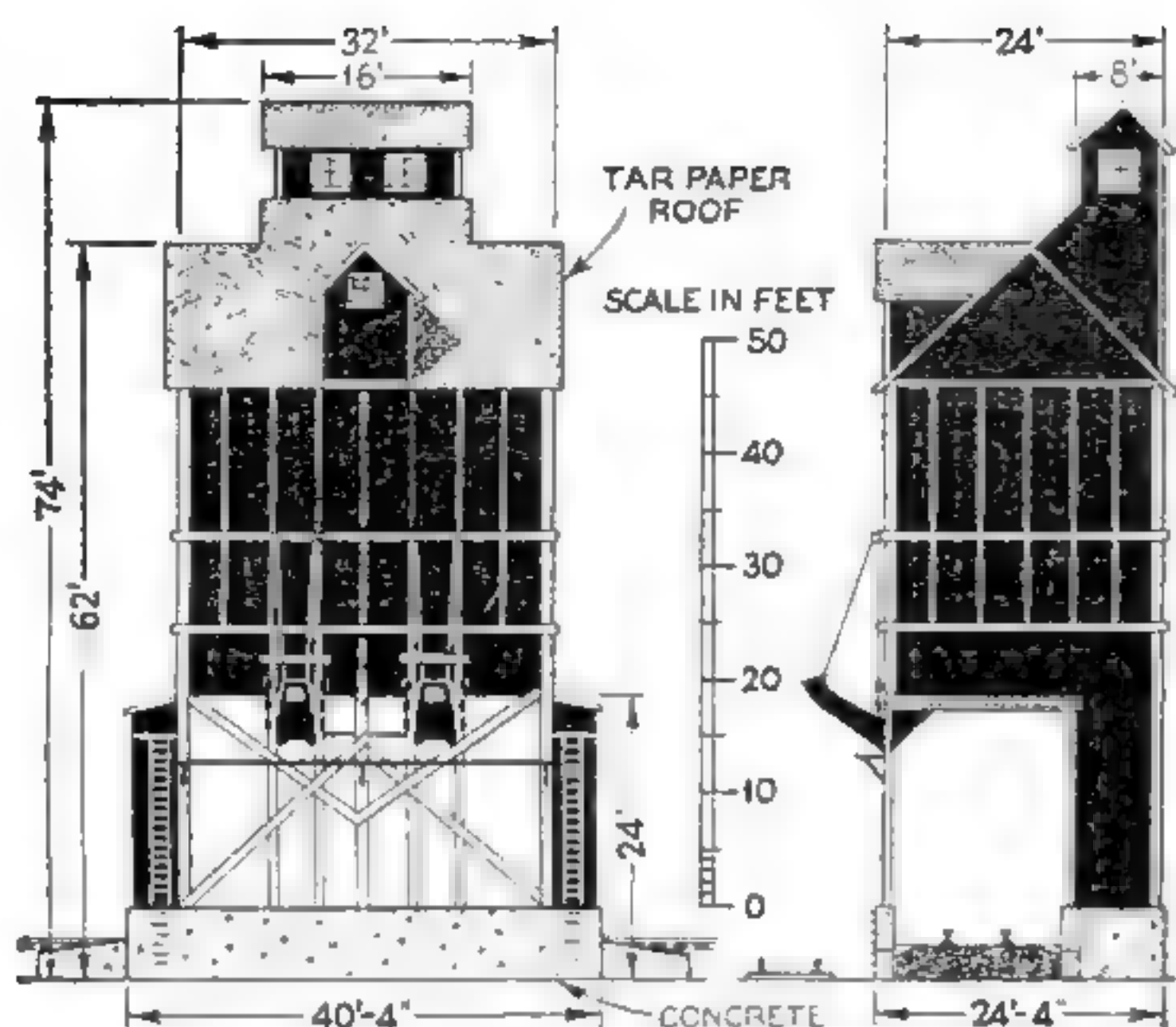


LACQUERING LINOLEUM FLOORS

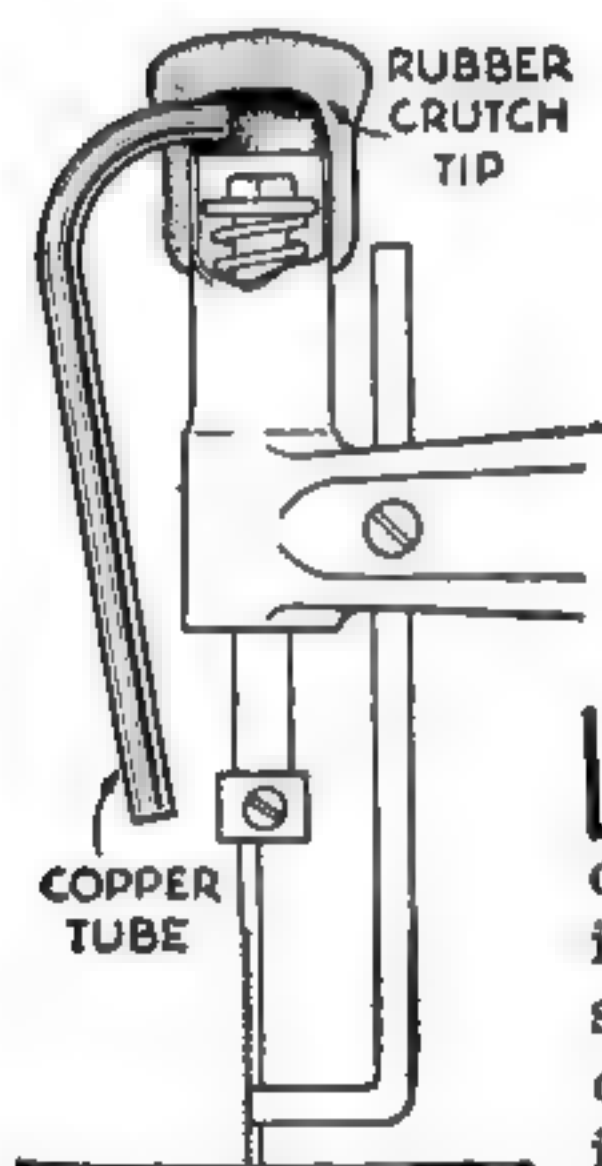
[PAINTING]

1. Wipe clean with trisodium-phosphate cleaner solution. Do not use soap powders. Dry one hour.
2. Brush on a brushing lacquer of the type manufactured especially for use on linoleum. Dry overnight with all possible ventilation.
3. Give a second coat, if desired.

This finish can be mopped freely with soap and water, which is desirable in kitchens to insure absolute cleanliness. The lacquer coating must, however, be renewed at least once a year. Do not use this method on printed floor coverings—only on inlaid linoleum.



Full-size dimensions in feet are given for convenience in working to any desired scale



Building a Coal Chute for a Model Railway

NO ENGINE yard of a model railway layout is quite complete without a coal chute. The foundation of this model is built up of wood blocks. The walls are cut from Bristol board or heavy cardboard and erected with small pieces of wood cemented inside the corners for strength. The roof is made in the same manner. The two chutes are thin metal, bent to shape and soldered. The track for the delivery of coal is 3' to scale higher than the other tracks and runs over a concrete pit inside the building. The building is painted black, and the roof to represent tar paper, while the foundation should be the color of concrete. Mount a flood light on a tall pole nearby.—**HAROLD A. SCHUPP.**

Sawdust Blower Added to a Jig Saw

LOW-PRICED jig saws are seldom equipped with built-in sawdust blowers, but a good one can be assembled as at the left. Select a rubber crutch or chair-leg tip that will fit snugly over the pipe which incloses the spring in the head of the machine. Drill a hole in the rubber as shown, slightly smaller than the outside measurement of a piece of old automobile fuel line or any available copper tubing. Bend the tube to shape and insert one end into the hole. Now slip the blower over the pipe head.—**LECIL J. SLABACK.**

PULLEY SPEEDS AND SIZES

[CALCULATIONS]

When power is transmitted from one shaft to another by means of pulleys and a belt, the diameter of the driving pulley multiplied by its speed equals the diameter of the driven pulley multiplied by its speed. Therefore, if three of these factors are known, the fourth can easily be determined.

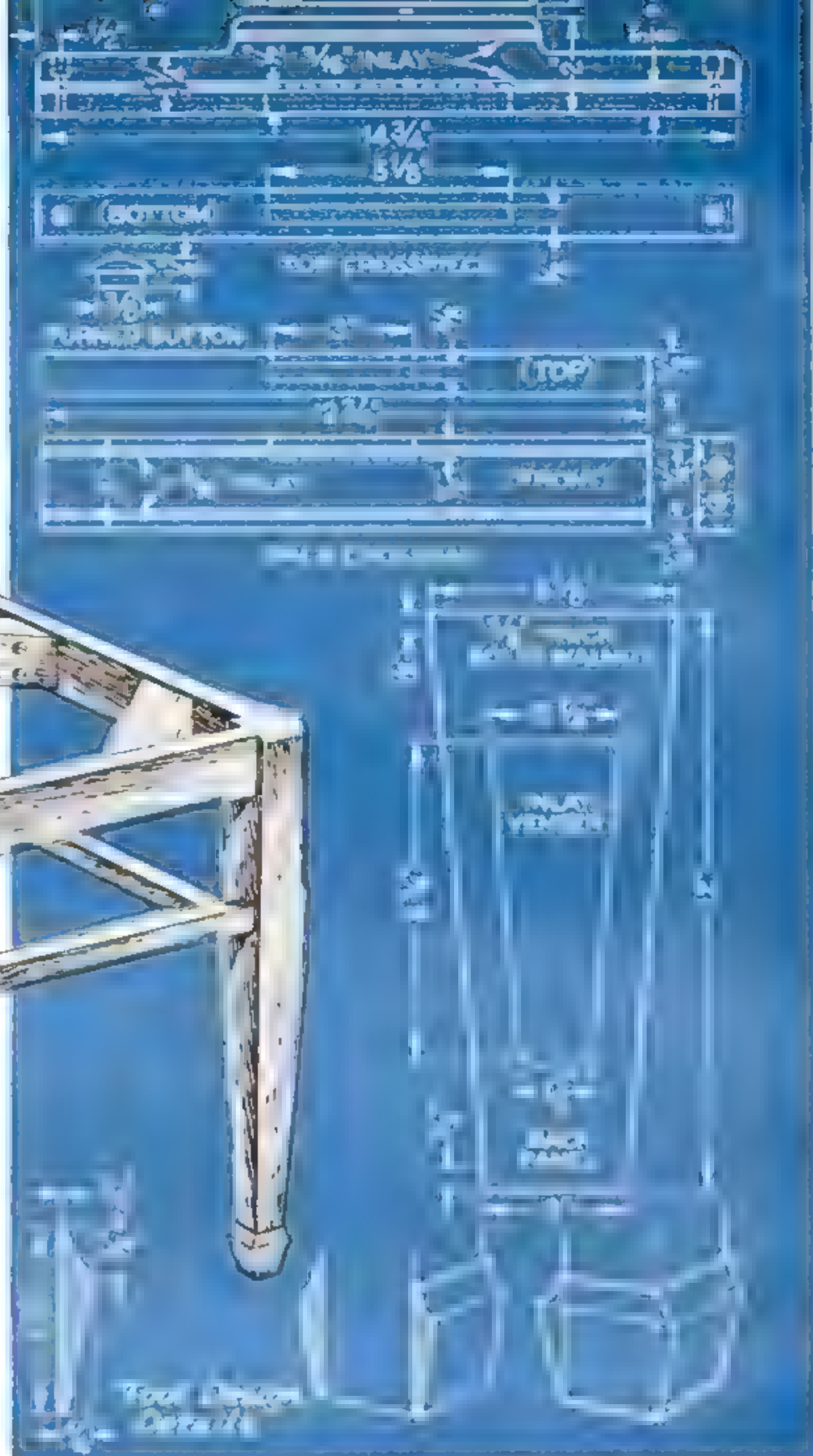
To Find	Having	Rule
Speed of driven pulley	Diameter of driving pulley, diameter of driven pulley, speed of driving pulley	Multiply diameter of driving pulley by its speed and divide by diameter of driven pulley
Diameter of driven pulley	Diameter of driving pulley, speed of driving pulley, speed of driven pulley	Multiply diameter of driving pulley by its speed and divide by speed of driven pulley
Speed of driving pulley	Diameter of driving pulley, diameter of driven pulley, speed of driven pulley	Multiply diameter of driven pulley by its speed and divide by diameter of driving pulley
Diameter of driving pulley	Diameter of driven pulley, speed of driven pulley, speed of driving pulley	Multiply diameter of driven pulley by its speed and divide by speed of driving pulley

POPULAR SCIENCE MONTHLY SHOP DATA FILE





Craftwork plaque awarded to the Wood-Ridge (N. J.) Homeworkshop Club. At right, chair before the seat is attached



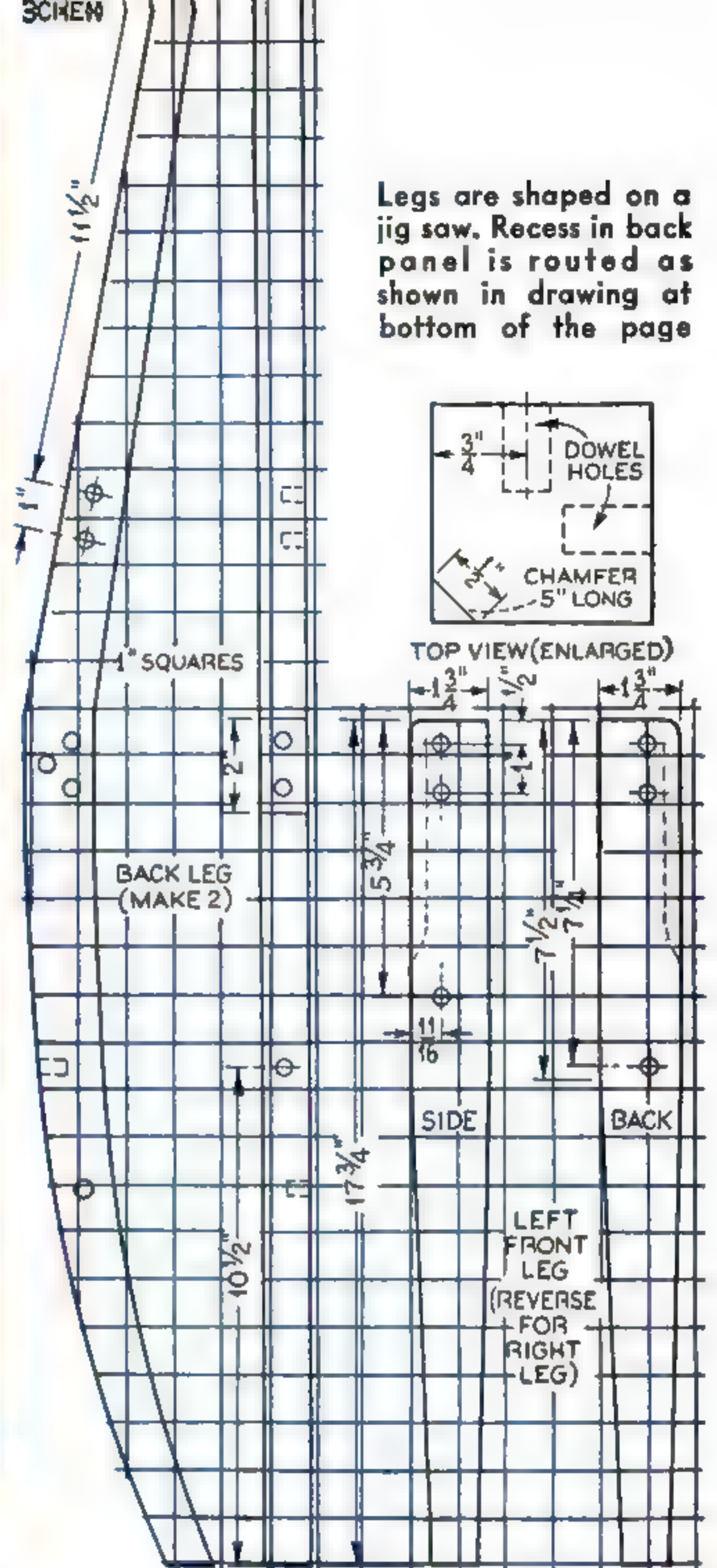
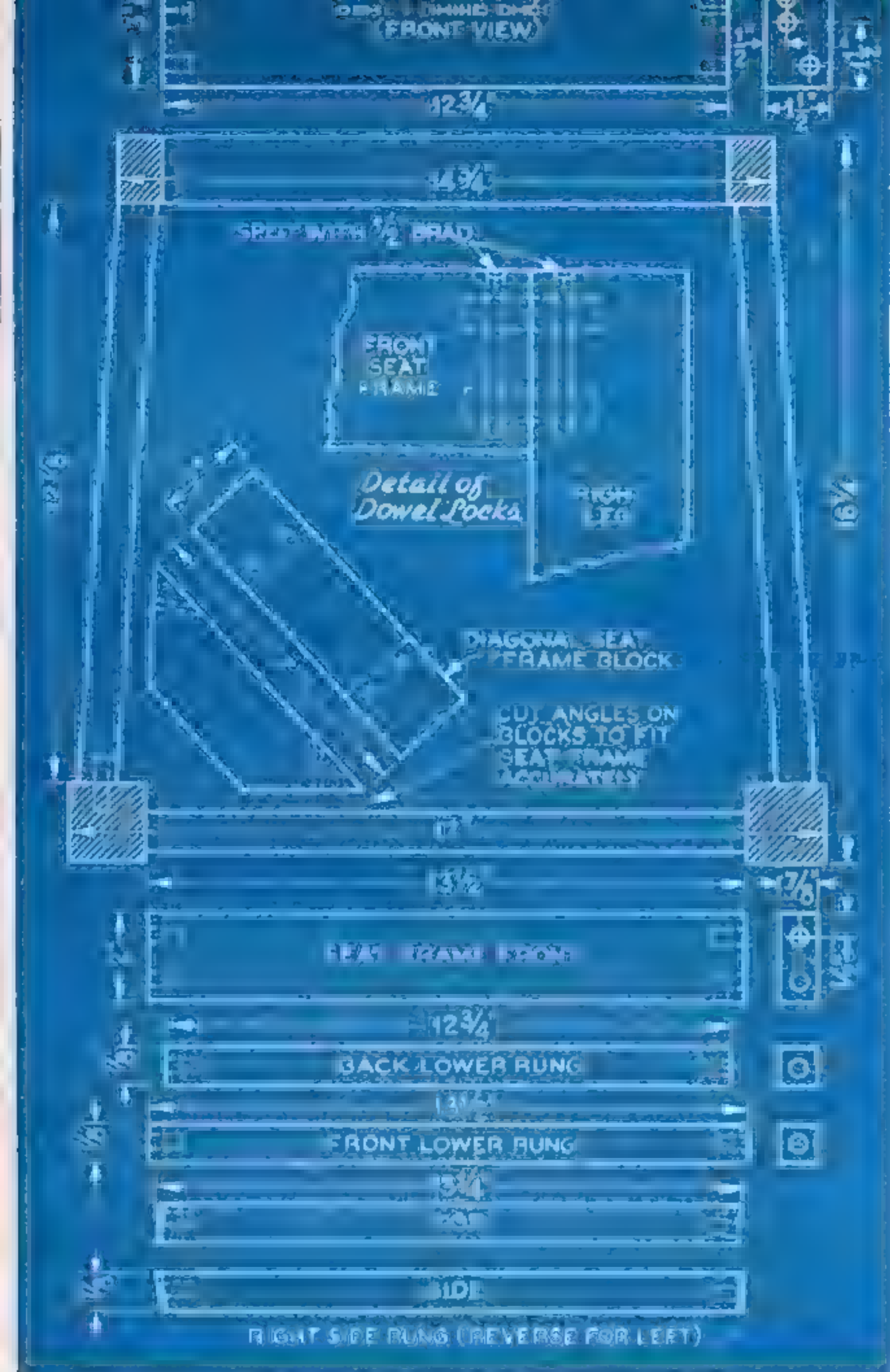
CONSTRUCTED FOR LIFETIME USE, THIS WALNUT SET HAS GRAY HAREWOOD INLAYS AND TAPESTRY-COVERED SEATS

PRIZE-WINNING Dining

MADE of American walnut with gray hawthorn inlays, this attractive set of dining room chairs was one of the two projects that won the 1938 national craftwork award for the Wood-Ridge (N. J.) Homeworkshop Club (see P. S. M., Sept. '38, p. 62). The chairs were designed and built by George N. Schalk. Accompanying drawings show the construction.

Shape back legs on jig saw, cutting tops off at right angles to slanting front. Bore holes as indicated, $\frac{5}{8}$ " deep on inside face of each leg and $\frac{3}{4}$ " deep on front.

Cut groove $\frac{1}{2}$ " deep with a router bit on underedge of top crosspiece and on top of back crossbar. Cut inlay grooves with router or circular saw. Use $\frac{1}{4}$ " router bit for routing recess

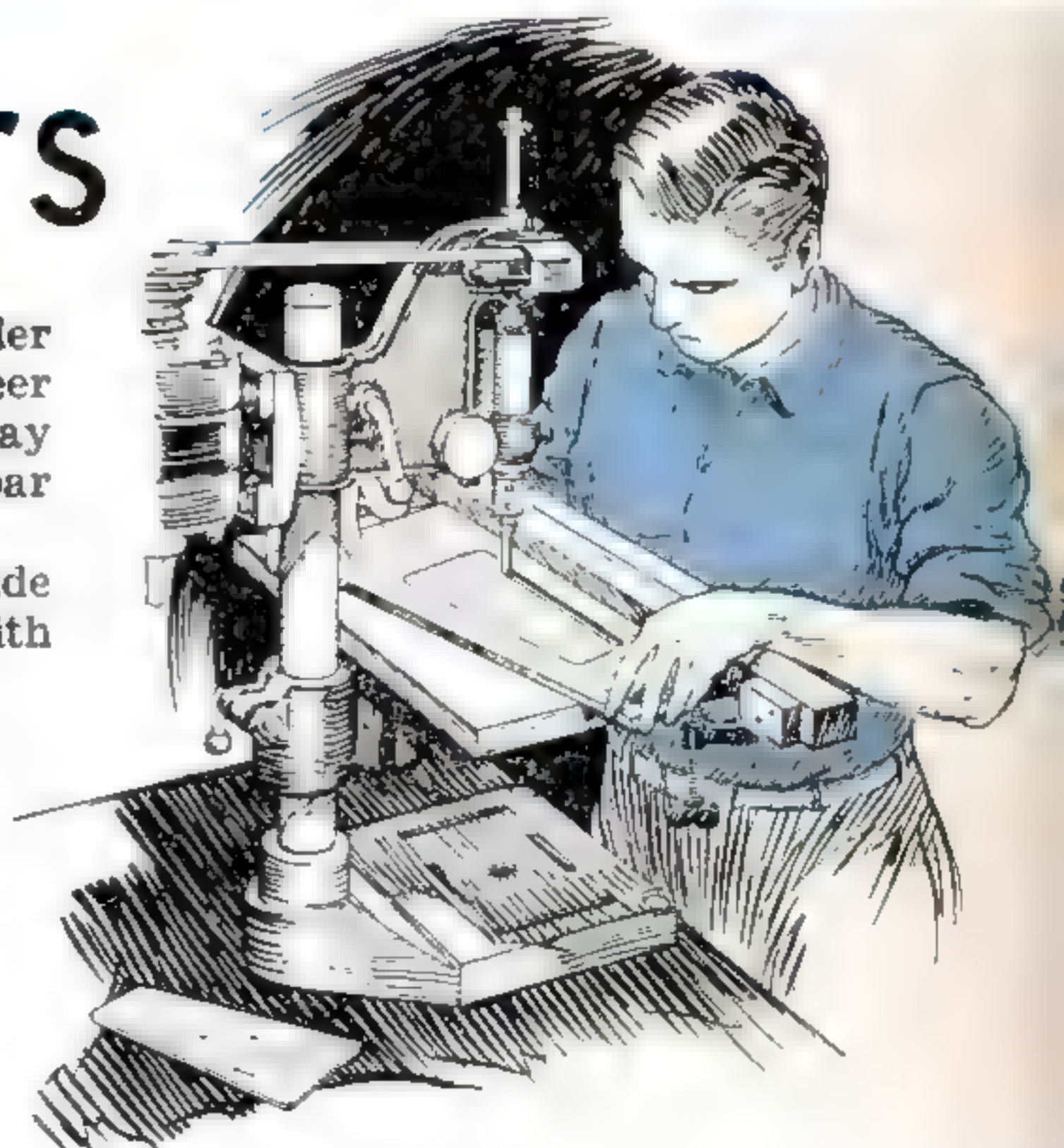


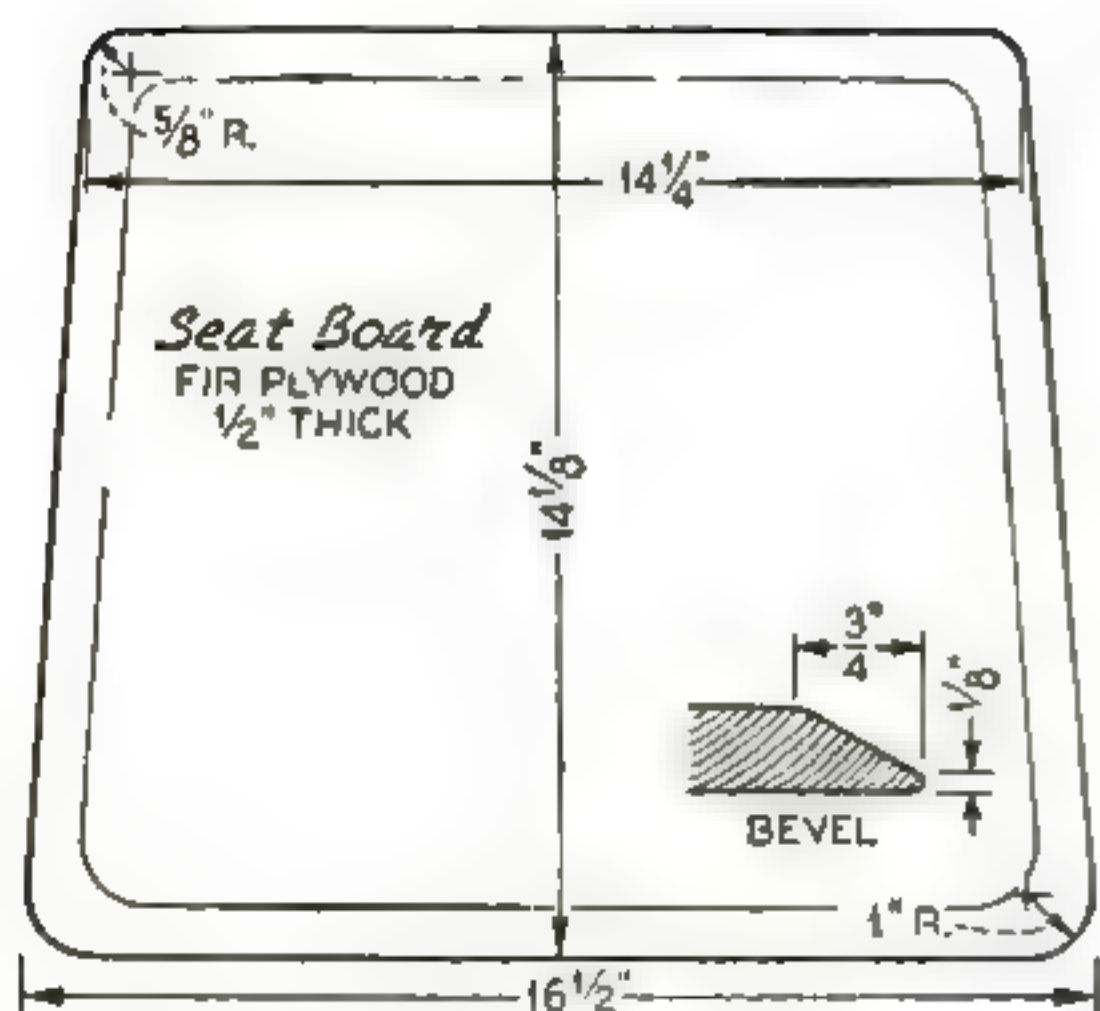
Room Chairs

1/28" deep in back panel. Glue inlays in place under even pressure and sand smooth. Gray harewood veneer is used on panel; inlay strips are predominantly gray with thin buff-colored side stripes. Cut top crossbar to shape on jig saw after glue has set.

Bevel top and round corners of seat, which is made of 1/2" fir plywood. Sandpaper and stain bottom with walnut stain, and apply one heavy coat of shellac. Cut piece of upholstery felt to size and hold in place with several dabs of glue. Cover with tapestry (tan with blue figure) and tack on underside. Trim and fold corners carefully. Dab shellac on tapestry edges on underside to prevent loose ends.

Cut and plane parts for seat frame. Round top front edge of backpiece with molding cutter or on shaper. Blocks 2" square are used for the diagonal





The seat is made of $\frac{1}{2}$ " plywood. When padded and covered, it is fastened to the frame with wood screws through the corner blocks



braces to allow sufficient room for two fastening screws.

Use jointer or saw to cut taper on all four sides of front legs. Slightly round top front and side edges. The stopped chamfer on outside corner is cut on jointer by gradually lowering front table with a block clamped to rear table. Drill dowel holes $\frac{3}{4}$ " deep. Design at bottom of legs is made from pieces $\frac{1}{4}$ " by $1\frac{1}{2}$ " with the grain running vertically. Pieces are $1\frac{1}{4}$ " and $1\frac{3}{4}$ " long, with concave molding as shown. Glue two $1\frac{1}{4}$ " pieces on opposite sides of leg, plane flush with taper, and then glue two $1\frac{3}{4}$ " pieces on other sides. When glue has hardened, plane taper on all sides of foot. Dress with sharp knife, rat-tail file, and sandpaper. Bevel bottom edges.

Cut rungs to full length and plane to width and thickness. There is a single angle on front end and double angle on back end of side rungs. Drill dowel holes.

To assemble, first glue together back legs, lower back rung, back of seat frame, cross-bar, inlaid panel, and top crosspiece. Use four bar clamps and screw down top stretcher. Glue wooden buttons in place. Next glue together the front legs, lower front rung,

and front of seat frame. Then glue front and back together, checking seat-frame angles. Glue and screw corner blocks in place.

Note that besides being held with casein glue, every dowel is locked in place by means of a $\frac{5}{32}$ " dowel glued transversely through the main dowels. These locking dowels are sunk below the surface, wedged in place by $\frac{1}{2}$ " brads, and covered with walnut-colored plastic composition wood.

Sand the chairs thoroughly. The finish is natural and without filler. Three coats of white shellac, well rubbed between coats, give a lighter colored finish than would be obtained with filler, and this method simplifies refinishing when necessary. After rubbing down the third coat with steel wool, use a good grade of furniture wax for a semipolish. Thin the first two coats of shellac with alcohol.

Guild Renews Offer of Free Manual to New Clubs

National Homeworkshop Guild
347 Fourth Avenue, New York

I want to start a home workshop club. Please send me full information in the large (legal size), self-addressed, stamped envelope I am inclosing.

NAME

ADDRESS

CITY.....STATE.....

DO YOU know five or six persons who are interested in the home workshop hobby? If so, you have the nucleus for starting a successful home workshop club in your neighborhood. The National Homeworkshop Guild will be glad to send you a free bulletin telling how to get the club under way. After you apply for a charter, you will receive a copy of the "Manual for Home Workshop Clubs," crammed with helpful ideas (see P. S. M., Oct. '38, p. 189).

Program Service Bureau

Gold Clubs
Spread Craft Hobby
Among Boys

Craftwork
on Display

Guild Achievement Awards
TO BE GIVEN ANNUALLY

GROWTH OF THE GUILD SHOWN BY CHART

The curve representing the growth of the Guild mounts each year as more craftsmen hear about the idea through Popular Science Monthly. Figures at the left stand for the number of active clubs

Offers Free Chart
to New Club

\$2000
NATIONAL
HOMEWORKSHOP
CONTEST

CONTEST

WANTED
A Craftsman's Club
In Every Town

The National

Homeworkshop Guild

CONTEST

1934 1935 1936 1937 1938 1939

THREE HUNDRED HOME WORKSHOP CLUBS

CELEBRATE THE Guild's Fifth Birthday

A LITTLE more than five years ago, POPULAR SCIENCE MONTHLY was asked by a group of enthusiastic amateur craftsmen in Rockford, Ill., to serve as the official magazine for a national organization they wished to start. It was to be a "mutual benefit association for those who follow any type of handicraft hobby." So, in the December, 1933, issue, an article appeared announcing the formation of the National Homeworkshop Guild



and inviting craftsmen to organize clubs.

There was then just one club in the Guild—the original Rockford Homecraft Club. Within a few months, similar clubs were springing up in many parts of the country as more and more craftsmen read about the movement. Today there are 300 clubs in forty-four states, the District of Columbia, Canada, and the Philippine Islands.

During the early formative stage of the Guild a group of distinguished men served on the Advisory Council. Among them were the late Frank A. Vanderlip, New York banker and publicist; Professor Collins P. Bliss, then dean of the College of Engineering, New York University; Dr. Hugh S. Cumming, former surgeon-general, U.S. Public Health Service; Harvey Wiley Corbett, New York architect; Dr. Clyde A. Bowman, dean of the School of Industrial Education, Stout Institute, Menomonie, Wisc.; and Dr. Francis G. Pease, astronomer, Mt. Wilson Observatory, Pasadena, Calif.

Outstanding among the many achievements of the Guild was its great national craftwork exhibition held at Chicago in 1935. That exhibition helped make the country realize how important the home workshop movement had become. Another milestone was passed in 1936 when headquarters were moved from Rockford to New York and national dues, which had been nominal from the start, were abolished. All services are now given without any charge, and the Guild is practically in a class by itself among great national organizations because it asks no financial support from its members. It is completely noncommercial and has no purpose except to promote interest in the hobby.

Many clubs will hold special meetings and

dinners in November to celebrate the Guild's birthday. Where several groups are located in or near the same city or town, the members plan to combine their efforts and sponsor a big get-together. These affairs will be the greatest mass tribute ever paid to the Guild and to the hobby at large.

At present many of the clubs are busy completing their Christmas projects. The *Helena (Ark.)* Homeworkshop Guild presented the local chamber of commerce with a list of members who would repair toys collected by the Boy Scouts. All recent meetings of the *Niles (Calif.)* Homeworkshop Club have been devoted to making presents for poor children.

A 12" planer has been added to the equipment of the Staley Handicraft Club, *Decatur, Ill.*, which has just moved into its new clubroom. The club also owns two jig saws, a band saw, circular saw, joiner, lathe, and drill press. Four of the members built boats last summer.



Above, kitchen table and chairs built by Charles Welsh, of the Staley Club. Left, some of the members in the new clubroom



Official Magazine
POPULAR SCIENCE
MONTHLY

Members of the *Orange (N. J.)* Homecraftmen Club proved the value of coöperation when they took a canoe abandoned by one member and repaired it so it can be used again . . . The *Fall River (Mass.)* Homeworkshop Club held a clam boil at the summer home of Allen Shoesmith and a beach party at Horseneck Beach . . . The *LeRoy (N. Y.)* Homeworkshop Club held its annual outing at Silver Lake. Richard Kellogg was in charge.

Secretary Edward H. L. Schaefer of the *Sohio Homeworkshop Club, Cleveland, Ohio*, reports that many of the members have purchased new equipment since the club was organized. Edwin H. Drake demonstrated how to make inlay pictures recently. William C. Brown has completed a pair of maple and



Model of a garage made by George Hermann, president of the Mount Vernon (N.Y.) club

walnut turned lamps, Adrian Roberts is constructing a combination hat and shoe cabinet, and Mr. Schaefer is building a model of a Great Lakes freighter.

From *Bais Central, Philippine Islands*, comes news that the Central Homeworkshop Club exhibited the following in the Tanjay Charity Fair and won first prize: two table lamps made by R. F. de Altonaga; sewing

cabinet, S. Grapa and A. Cusio; hat rack, N. Mueda; two cribbage boards, R. Alonso; center table, R. de Altonaga and S. Grapa. The club also donated several hundred American and Philippine flags and small wooden crosses to the municipalities of Bais and Tanjay for the decoration of cemeteries on Memorial Day.

How It All Started

A MESSAGE FROM LE VERN T. RYDER First President of the Homeworkshop Guild

FIVE long years! Yes, they do appear long when looking ahead at them, but how swiftly they pass and how many things can happen!

Five years ago we were discussing the possibilities of starting a national guild of home workshop fans. We had a very successful club in Rockford, Ill., and many letters were being received from persons who wanted to start similar clubs. My good friend E. Raymond De Long and I finally persuaded some of the men to join us and incorporate the National Homeworkshop Guild.

As I look back at those first few months, I wonder if we would have gone ahead with so much enthusiasm had we known the immense amount of work that was ahead of us. With the announcement in our official magazine, *POPULAR SCIENCE MONTHLY*, came a deluge of letters, telegrams, and phone calls. We rushed to print more "first reply" letters. Still the inquiries came. Clubs and more clubs

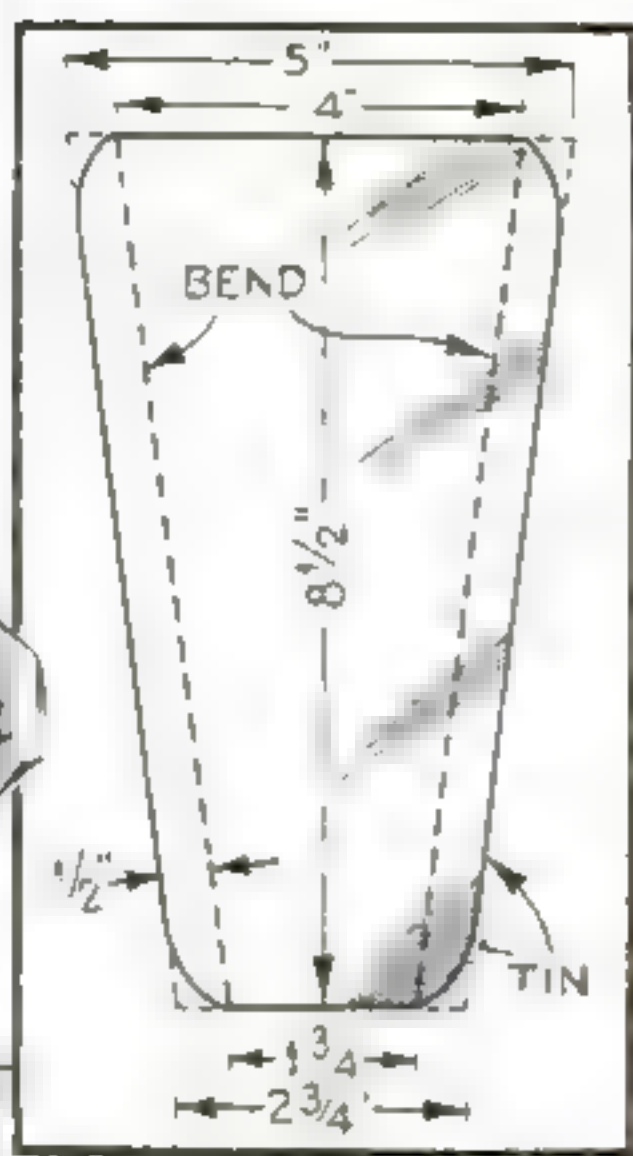
were being formed.

We at the home office in Rockford were spending all of our spare time and more answering correspondence, making out charters, and signing membership cards. Finally we turned over the entire task of sponsoring the Guild to *POPULAR SCIENCE MONTHLY*, which so ably carries it on.

The National Homeworkshop Guild has done, and will continue to do, more good than anyone can realize. As first president of the Guild, I want to express my thanks to the officers, directors, counsel, attorney, honorary advisory committee, Raymond J. Brown, editor of *POPULAR SCIENCE MONTHLY*, and all others who have given so freely of their time to promote our guild of home craftsmen.



Double-End Sorting Tray and Scoop



Small nails and screws are easily scooped up and slid into jars with the aid of a tin tray

MANY amateur craftsmen keep their finishing nails, small bolts and nuts, washers, screws, and other hardware in glass jars. When this is done, it pays to make a double-end tin sorting tray or scoop as shown. The contents of a jar can be emptied into the tray, the desired items picked out, and the remainder poured back from the small end of the scoop. The wide end may be used in gathering up any of the stock scattered over the bench. The tray also serves as a miniature dustpan for cleaning up around the vise, drill press, or grinder.—C. W. HOUGH.

Manicure Tools for Model Making

TOOLS from old manicure sets make excellent implements for model making. Cuticle "pushers" can be sharpened for use as cutters, and nail files become wood files.—L.T.

Cover Conceals Bathroom Cleanser

A DECORATIVE cover to hide an unsightly cleaning-powder container in the bathroom may be made from a coffee can. Discard the top of the coffee can, punch a hole in the center of the bottom, and fasten on a small drawer knob. Paint the can to match the color of the bathroom. When the paint is dry, an appropriate transfer de-

sign may be applied, if desired. Paint stores usually carry a variety of transfers or decalcomanias. These merely require to be soaked in water, placed in position, and the top layer of paper slid off to reveal the design, which remains attached firmly to the surface of the can. No shellac or varnish is necessary.—E. RUSSELL OSBORN.



IDENTIFICATION OF NAILS

[HARDWARE]



COMMON NAIL



COMMON BRAD



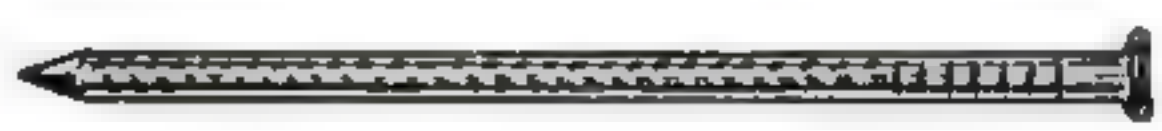
CASING NAIL



FINISHING NAIL



SMOOTH BOX NAIL



BARBED BOX NAIL



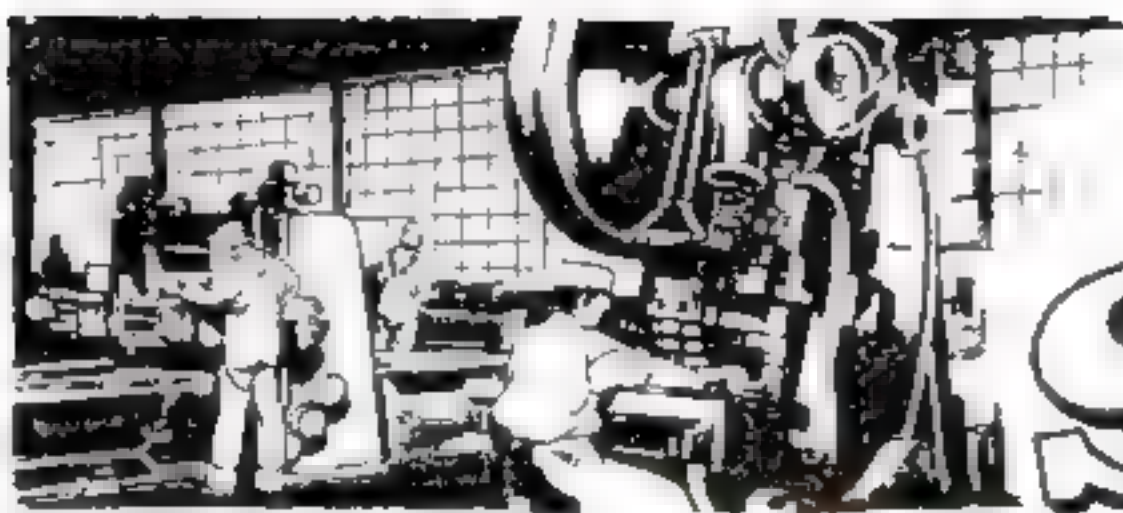
FLOORING BRAD



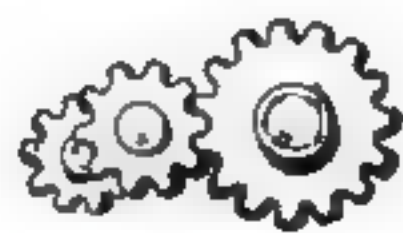
ESCUTCHEON PIN

NOTE: Except for the escutcheon pin, the types shown are the actual sizes of six-penny (2") nails. Escutcheon pins are commonly available in lengths of 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", and 1 1/2", and in eleven wire gauges from No. 10 to No. 20, but not in all gauges for all lengths.

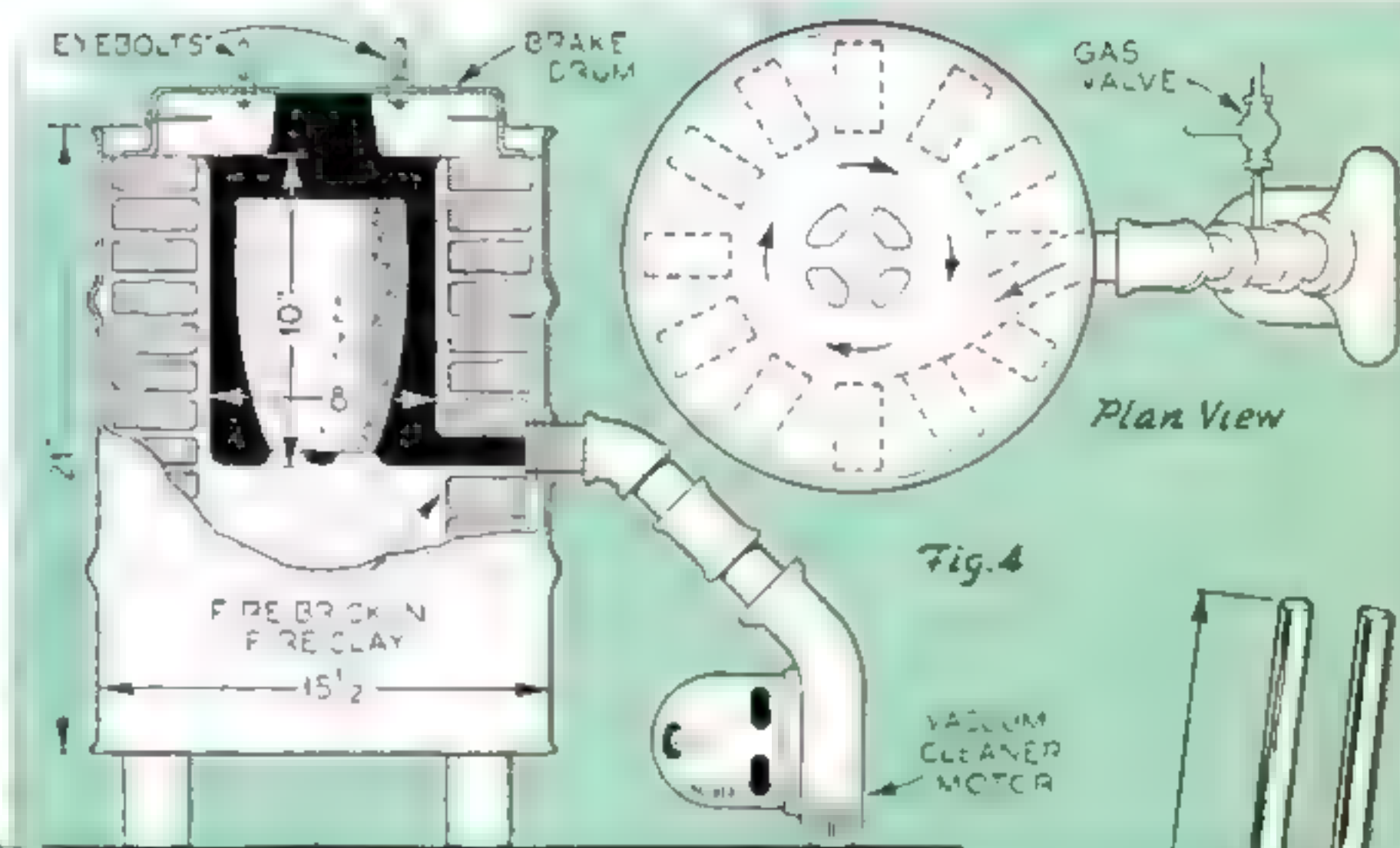
POPULAR SCIENCE MONTHLY SHOP DATA FILE



new SHOP IDEAS



SMALL FOUNDRY for casting the softer metals

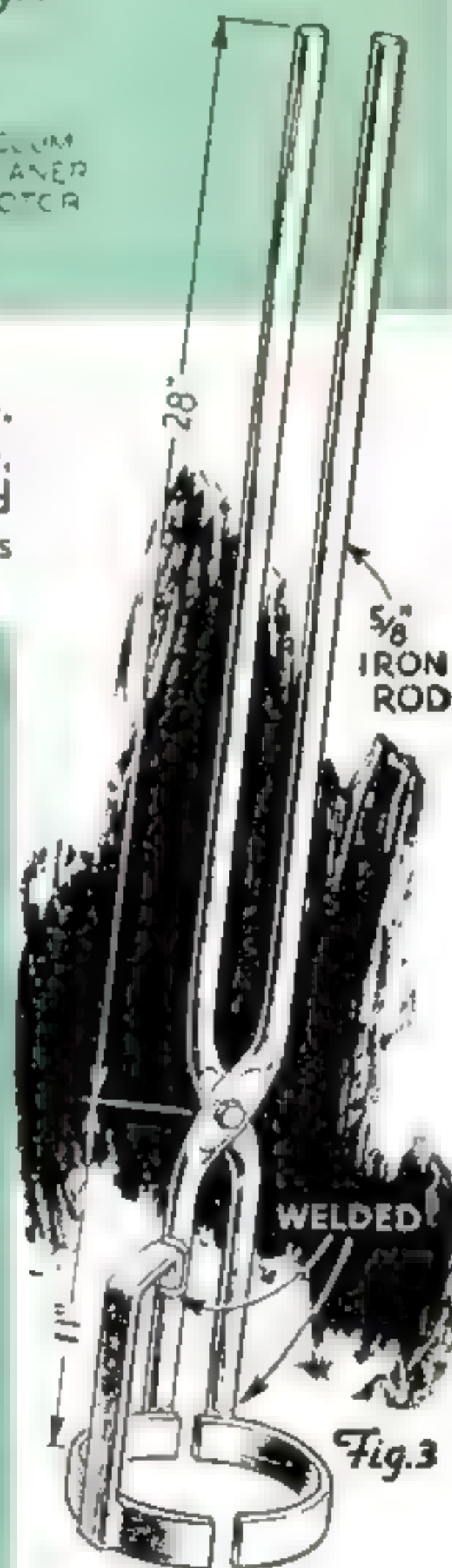


How the furnace is made. Left, lifting the crucible, which heats a glowing red in less than five minutes

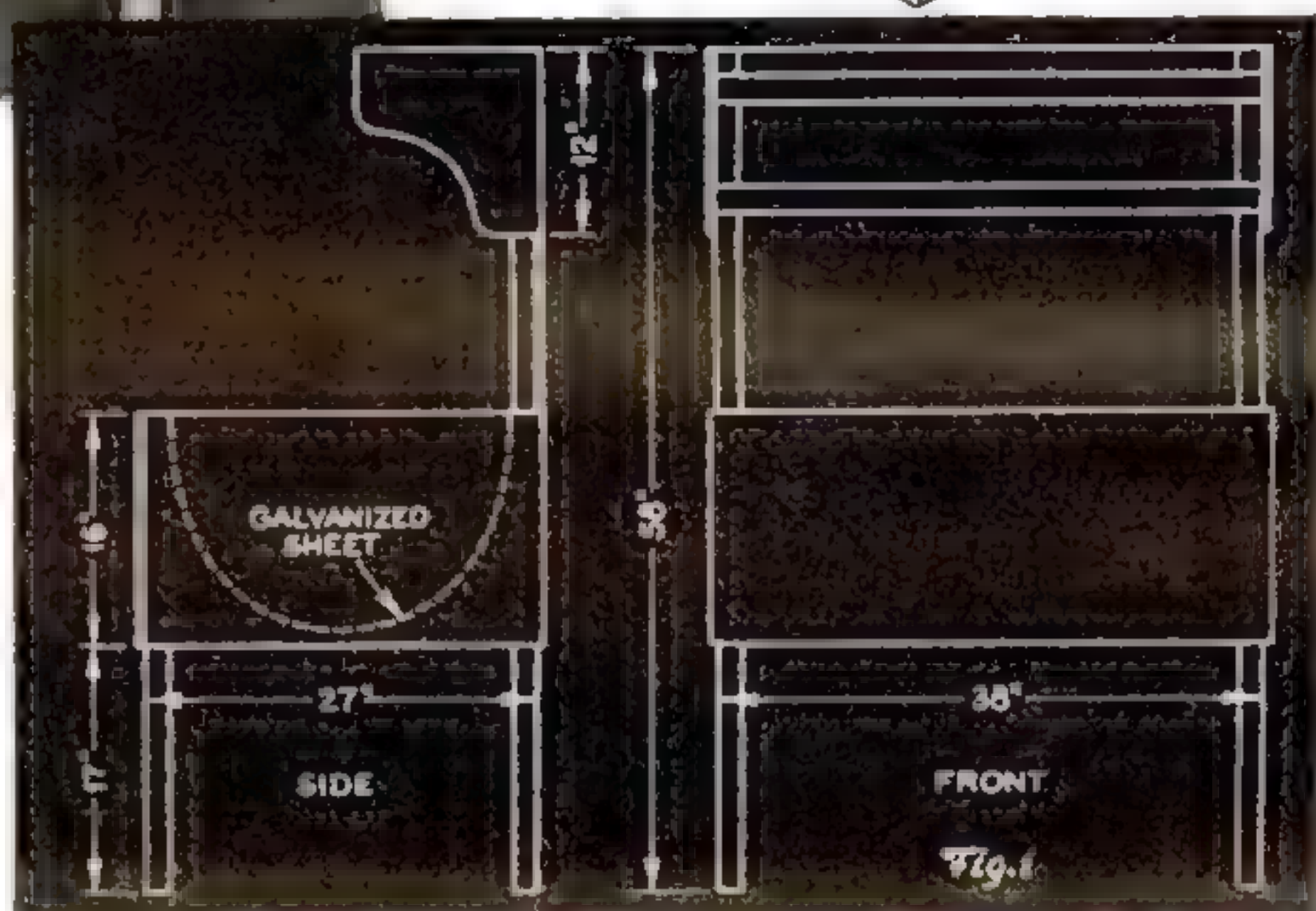
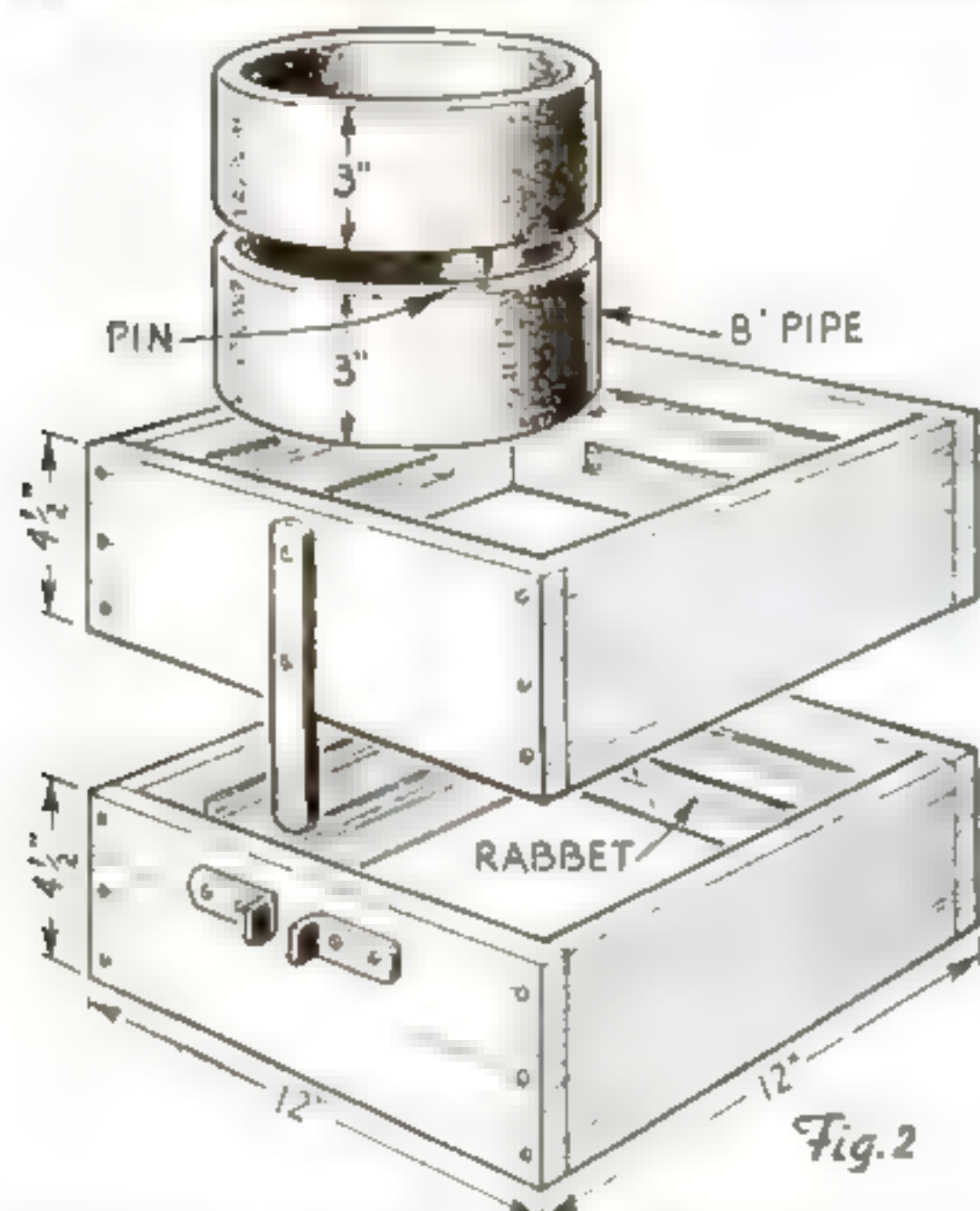
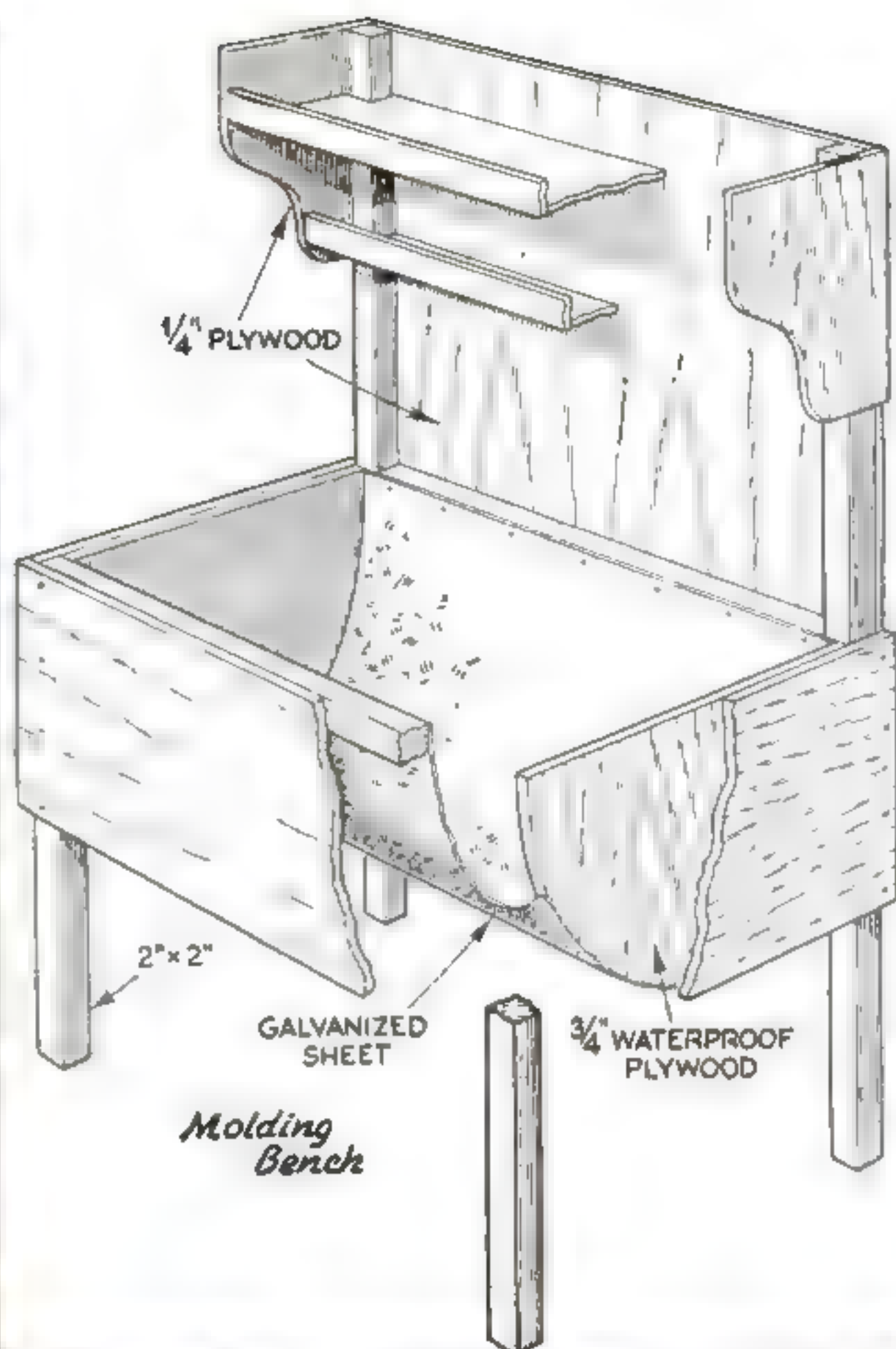
FOUNDRY equipment for casting aluminum, brass, and various soft alloys in the small shop or home workshop can be made for a comparatively small outlay as shown in the illustrations on this and the following page.

The molding bench (Fig. 1 on the next page) has a sand-box consisting of special waterproof plywood ends and a curved sheet of galvanized iron. The plywood is of the so-called "superhardboard" variety, but if no material of this type is available locally, solid wood ends faced with galvanized iron on the inside may be used.

Flasks can be constructed either of wood or sections of large iron pipe (Fig. 2). Two pins are set into the iron flask to insure alignment, while steel brackets serve this



The crucible tongs. Left, the furnace cover is made from an old brake drum



Drawings of the molding bench with principal dimensions; sketch of the bench; a photo of it in use; and, left, two molding flasks

purpose on a wooden flask. Note the grooves on the inside faces of the wooden flask to prevent sand from falling out.

Tongs for lifting the crucible out of the furnace are shown in Fig. 3. They are used as illustrated at the beginning of the article. The furnace itself, Fig. 4, is made from a small oil drum and a discarded vacuum-cleaner motor and fan. The head of the drum is cut out with a chisel, which is not an especially tedious job. The motor is connected with pipe fittings, and the drum thickly lined with fire clay over fire bricks set radially as indicated.

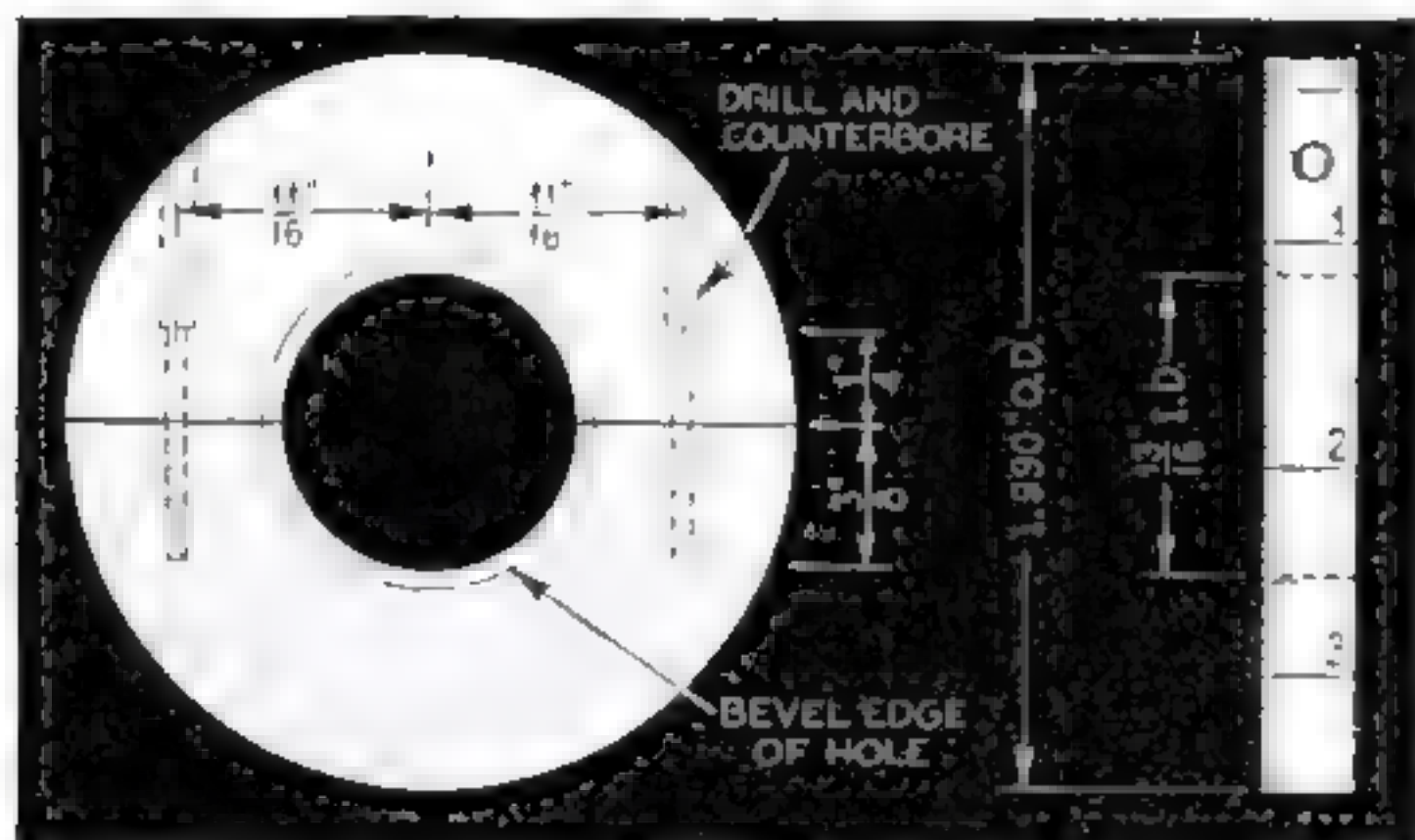
Note that the flue from the blower comes

into the chamber at an angle, causing the flame to whirl around the crucible. Four small fire-clay bosses are made in the bottom of the chamber to permit heat to flow underneath the crucible. The lid is simply a brake drum packed with fire clay, which is held in place by nails inserted in the rim. The opening of the drum is formed by a slightly tapered sheet-metal cone, and the melting chamber in the drum is formed with the aid of a sheet-metal wall.

The original equipment, built by Lester Hall, of Pasadena, Calif., has produced a number of clean-cut castings, and is adapted to a large range of work.—HI SIBLEY.

Micrometer Scale

ADDED TO LATHE TAILSTOCK



The toppiece is drilled with a No. 42 drill and counterbored with No. 22 to within $\frac{1}{4}$ " of the bottom. Drill the bottom piece No. 49 and tap 2-56

IF YOUR lathe has no tailstock scale, a convenient one that is capable of great precision for fine drilling can be made as shown from a $\frac{1}{4}$ " by 1" rectangular duralumin or brass bar. The two pieces are drilled, counterbored, and tapped while still rectangular; then clamped together on an arbor and turned to 1.990" in diameter.

The tailstock screw on a typical 9" lathe has ten threads to the inch, so the periphery is scribed into 100 divisions, with lines of appropriate lengths for the tens, fives, and units marks. If a dividing head is available, such as that described in a previous article (P.S.M., Oct. '37, p. 96) this is a simple matter; otherwise wrap a flexible steel tape scale around the circle and mark every $\frac{5}{16}$ ". This will give twenty divisions around the circle.

Use $\frac{1}{16}$ " or $\frac{3}{32}$ " steel stamps to mark the tens, and fill all numerals and scribed marks with black crayon. The scale should face to the left, and the numbers increase from 0 to 9 as the top of the wheel turns away. Clamp the two halves of the finished scale just ahead of the tailstock



wheel, after putting a small bevel on the inner side of the $\frac{13}{16}$ " hole.

The nut at the rear of the tailstock body is drilled and tapped to take a $\frac{1}{4}$ " 4-36 machine screw, which holds a short wire index pointer. One revolution of the wheel corresponds to 0.100" travel, and each division on the machine-divided circle is 0.001".—G. F. LAMPKIN.

Auto Valves Make Fine-Looking Tools

DURABLE, nonrusting screw drivers, small socket wrenches, and a variety of other special tools may be made from discarded chrome-steel automobile valves, which are obtainable for little or nothing at junk yards and garages.

Two generally useful sizes for making the screw drivers are with $\frac{1}{8}$ " and $\frac{1}{4}$ " faces. Both sizes, of course, require turning down on a lathe, and the faces must be ground. In making small socket wrenches, it is necessary to use high-speed drills for drilling the center holes because the material is very hard. Knurling, as shown in the accompanying illustration, will further improve the appearance of the tools.—F. R. GONSETT.

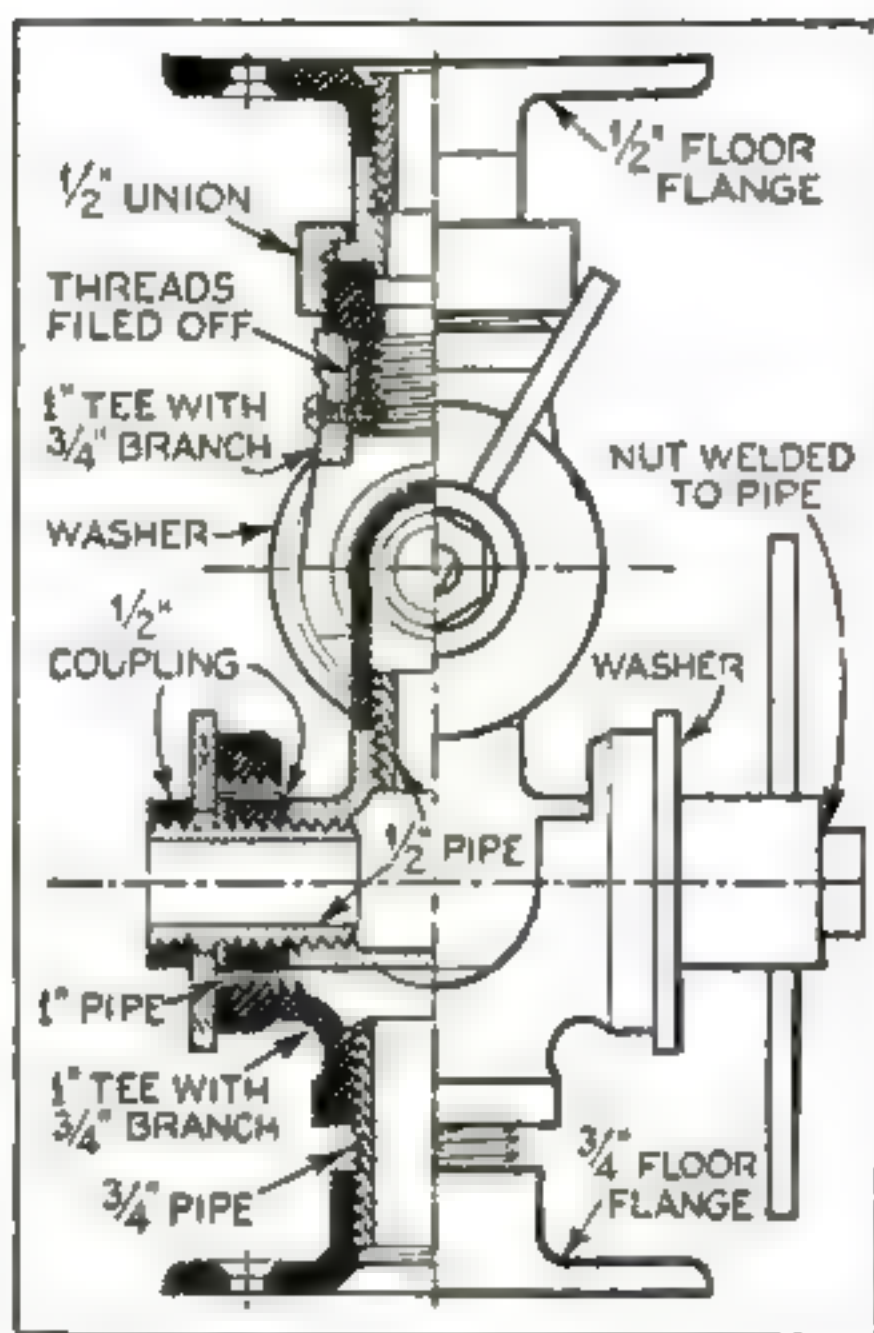


Universal Tilting Shop Stand

ASSEMBLED FROM PIPE FITTINGS

AN EXTREMELY rigid shop stand, which can be tilted and swiveled to any angle, can be made from a few pipe fittings.

Screw short lengths of pipe into the ends of two 1" pipe tees and cut the pipes off flush with the ends of the tees. Cut away the central part of the 1" tees so that 1/2" tees can be slipped into the larger tees as shown. To form a bearing for the 1/2" tees, screw a short pipe, with a narrow piece of coupling on it, into each end of the 1/2" tees. If necessary, file down the outside of the couplings so they will turn freely in the 1" pipes in the large tees. Lock the pipes in the 1/2" tees with pins or machine screws. Slip large washers over the outer ends of the 1/2" pipes and screw sections of couplings up against these. At one end of the tees, screw the coupling and washer up



The stand is useful for soldering and it can be used as a base for a drill-press vise. Left, how the parts are assembled

tight against the inside coupling. Let the coupling on the other end overhang the pipe, drill a hole through the coupling, and insert a rod for a handle. If the stand is to be used for heavy work, weld a nut to the coupling as shown so

the stand can be tightened with a wrench instead of the crossbars.

Fasten a 1/2" pipe union in the branch of one of the 1" tees so the top of the stand can be swiveled, and screw short nipples and floor flanges on the top of the union and the branch of the other 1" tee.—MERLE TERRILL.



Bearings for the 1/2" tees are formed from short pieces of pipe and narrow pieces of coupling. Right, stand with drill vise



Jig for Cutting Screws to a Uniform Length

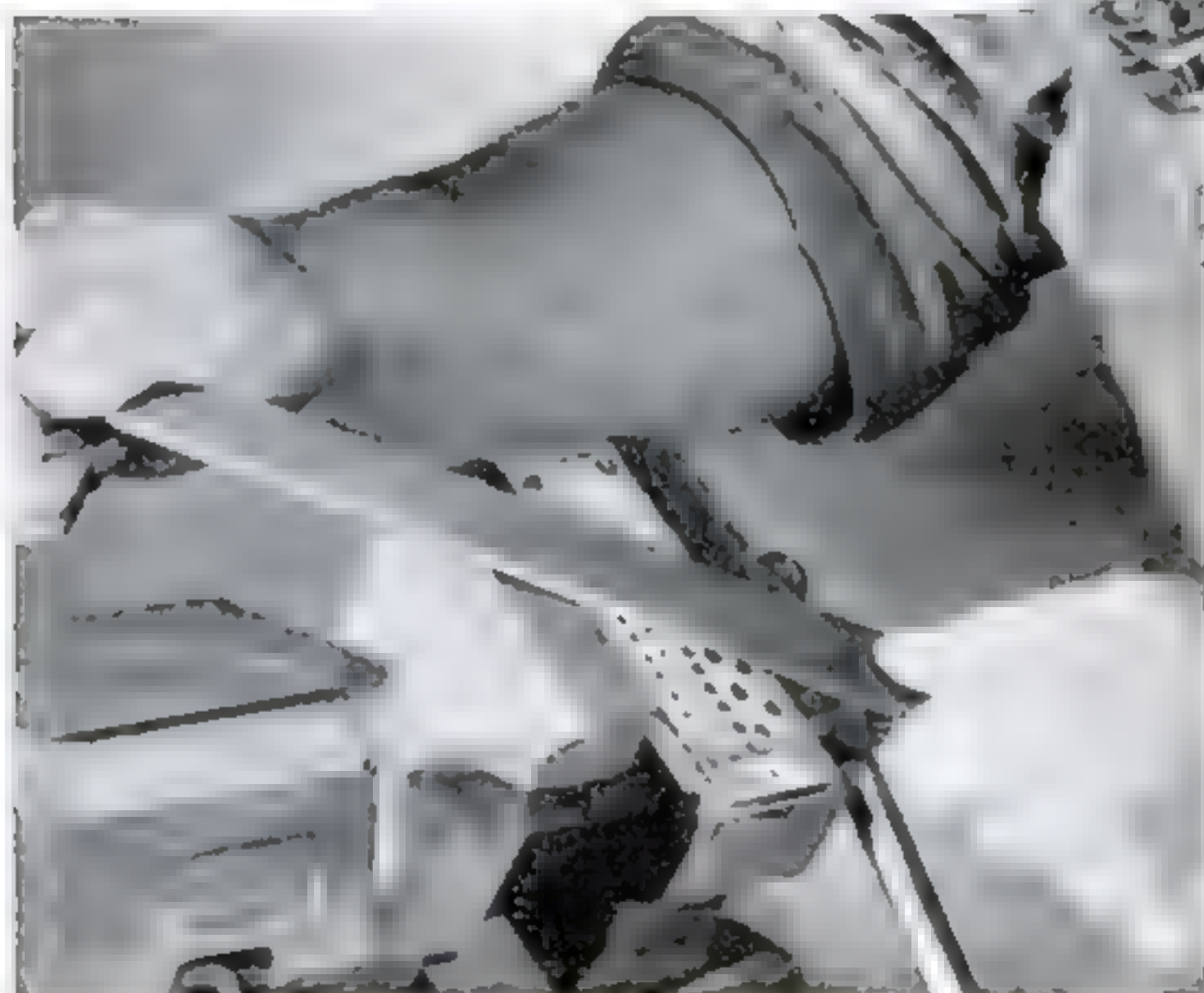
SCREWS frequently have to be cut off to a certain length. This can be done quickly without injuring the threads by holding them in the device illustrated.

Two plates, perforated for screws of various sizes, are held together with machine screws. The flat heads of these screws are countersunk into the upper plate deep enough so the screws will just turn freely when nuts are tightened against the heads as shown. The screws fit in threaded holes in the lower plate, thus allowing the plates to be spaced any distance apart. A third plate is fastened to the bottom plate and slips over the heads of the screws to be cut off. This is to keep them from falling out.

The screws to be cut off are dropped into the holes in the two plates; the third plate is slipped over their heads and tightened, and the top plate is adjusted to the proper height by turning the screws in the corners. The screws are then filed down level with the top plate, as demonstrated in the photo below.



At top, inserting the four machine screws that hold the main plates together. Above, how the third plate closes over the heads of the screws



When the screws are locked in the jig, it does not take long to file them off level with the top plate

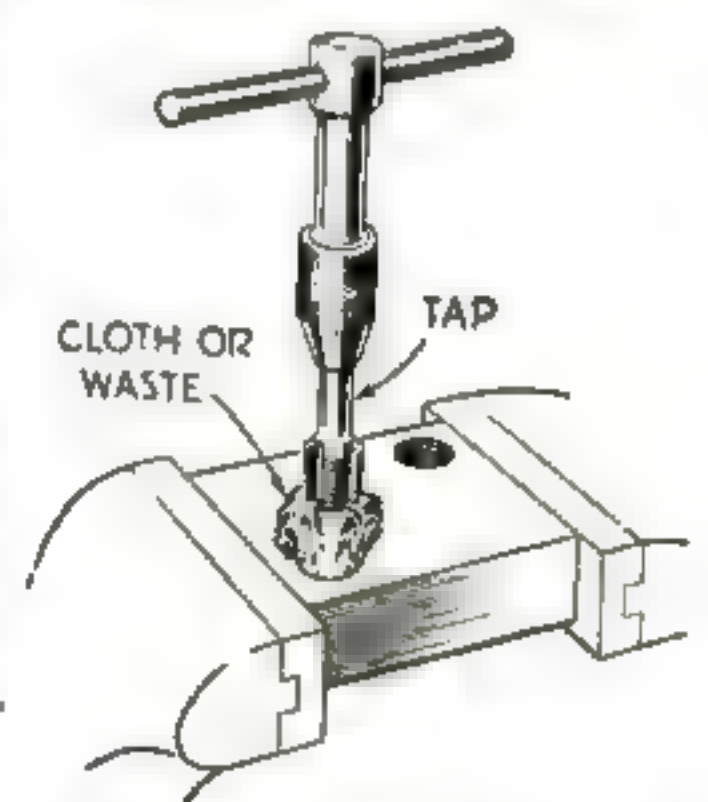
Metal-Cutting Teeth Filed in Back Edge of Handsaw

IN REPAIR work about the house, a nail, steel plate, or bar is sometimes encountered where it must be cut. If no hack saw is available, it is possible to file small teeth for a short distance along the back edge of an ordinary handsaw. This will not harm the saw, and the extra teeth will serve for an occasional job almost as well as a regular metal-cutting saw, provided the metal to be cut is not too hard.—JACK L. ROGERS.

How to Make a Tap Cut Larger or Smaller

A HOLE that has been tapped slightly undersize may be enlarged with the same tap if a piece of cloth or waste is wrapped around the tap and the hole rethreaded. The same method is sometimes used by machinists to free tapped holes in which screws fit too snugly.

When necessary, a tap may be reduced from 0.0005" to 0.001" by immersing it in a solution of one part nitric acid and one part water for from one to two minutes. Best results are obtained if both the tap and the solution are moderately warm. Use care to prevent burns from the acid, and neutralize the tap immediately by washing in ammonia or water. Acid may also be used to loosen a tap that has broken off in the hole so it may be removed.—PETER F. ROSSMANN.



If cloth or waste is wrapped around a tap, it will rethread a hole so it is slightly larger

Table-Top Factories



MAKING PAPER
FROM WOOD

The process by which wood is transformed into paper can be demonstrated easily. Particles scraped from a piece of white pine, as illustrated above, are treated chemically, bleached, and washed. Photo at left shows the final step, in which the pulp is poured out onto a wire screen for drying

By
RAYMOND B. WAILES

THE ancients probably never wrapped their groceries in papyrus—paper made from marsh reeds instead of wood. There wasn't enough of it. They had no axle grease but "hog lard" for their warriors' chariots. Their pottery was colored with pigments of very few hues.

Today we have almost unlimited quantities of cheap paper; greases and oils of a thousand grades; and brilliant, prismatic-tinted pigments and paints that actually vie with the rainbow in variety and radiance. And there was nothing even to compare with modern plastics among the trinkets that early craftsmen fashioned out of metal and clay.

Have you ever wondered how these newer things are made? Even with the simplest of equipment, in your home laboratory, you can try your own hand at manufacturing them. Your test tubes and flasks will yield materials

that were utterly beyond the power of the wisest men of earlier times to produce.

How to transform wood into paper, for example, would have baffled the ancient papyrus makers. But you can do it easily. A piece of white pine will serve nicely for the raw material. Convert it into fine particles by rubbing it with a rasp. Sift the raspings with ordinary window screen, discarding the fragments that are too large to pass through the mesh. Collect about a teacupful of the sifted particles. This operation corresponds to the one called "breaking" or "beating" in modern paper making.

Now boil the raspings for ten to fifteen minutes in a solution made by dissolving about twenty grams of sodium hydroxide, or ordinary lye, in 100 cubic centimeters of water. (For this and other measurements, it may be helpful to recall that a teaspoon

• IN YOUR OWN LABORATORY YOU CAN SHOW HOW

for Home Chemists

holds about five grams of most powdered chemicals, or three and a half cubic centimeters of a solution; and that the capacity of an ordinary drinking glass is about 240 cubic centimeters.) The caustic solution extracts gums, resins, and other soluble substances, leaving the cellulose of the wood fibers. Pour off and discard the brown-stained liquid, and repeat the boiling with a fresh batch of the sodium hydroxide solution. This extracting process corresponds to the one called "digestion" in a modern paper mill.

To remove the caustic, let the pulp settle in a tall, slim vessel of water, such as a large cylindrical graduate. Wash the pulp by decantation—that is, pour off the top water; add fresh water; let the pulp settle again; and pour off the top water once more. The pulp is now ready for bleaching.

Since chlorine gas will be the bleaching agent, you should perform this operation outdoors. Put the washed wood pulp in a beaker or flask, add enough water so that the layer of pulp comes about halfway to the surface, and let the gas bubble through it. You can make the chlorine by allowing muriatic acid (hydrochloric acid) to drip from a stopcock funnel into a flask holding crystals of potassium permanganate, piping out the gas through the other hole in the two-hole stopper. The set-up is the same that has previously been described in this series for generating gases of many kinds. For a single bleaching "run" or operation,

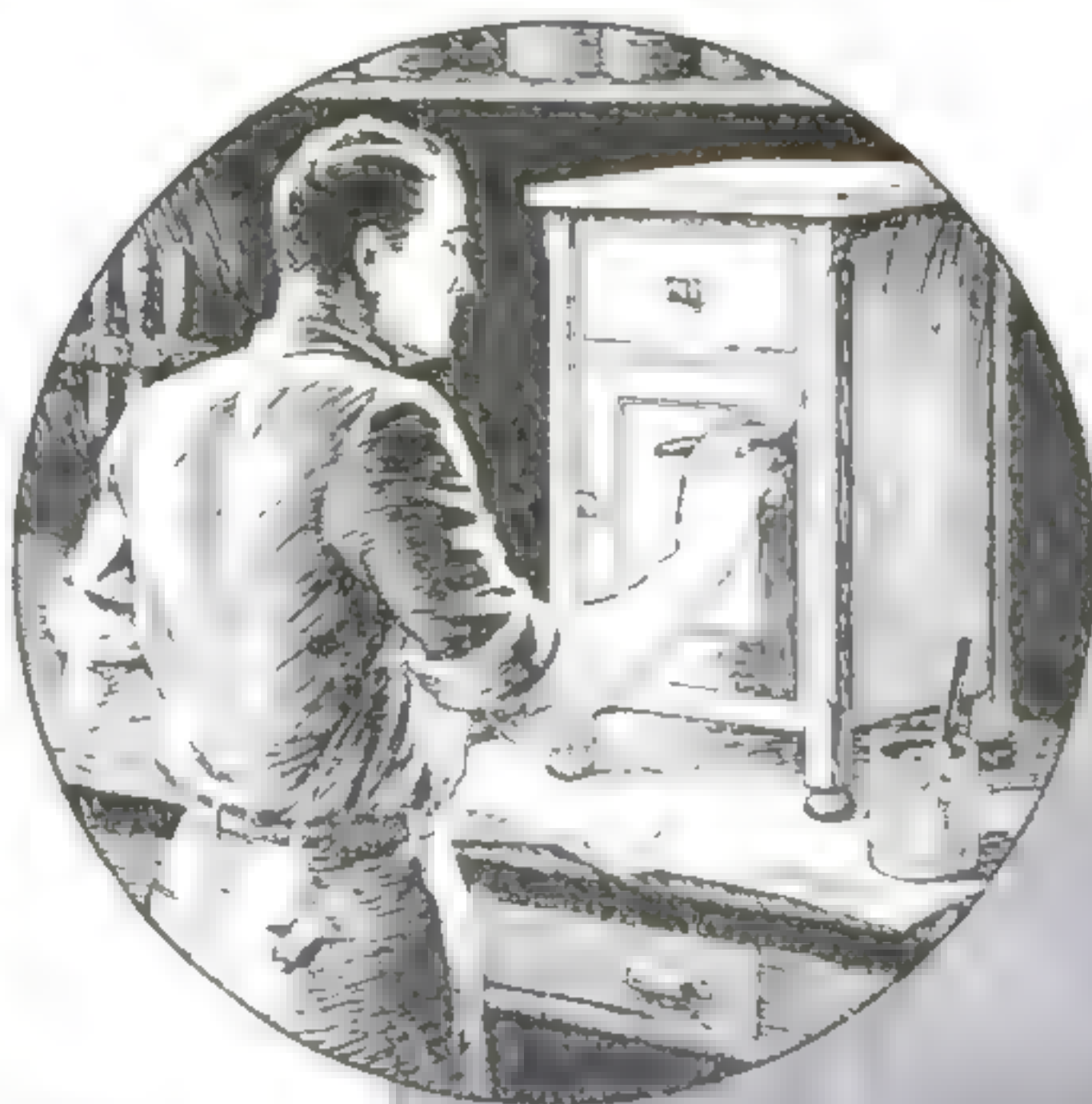
COLORS FROM THE TEST TUBE

You can produce brilliant pigments by the same methods that are followed in paint and dye factories. At the right, homemade coloring materials are being filtered out. Note the handy filtering rack in which dowel rods support the funnels and the beakers rest on a glass hand plate of the type used on doors

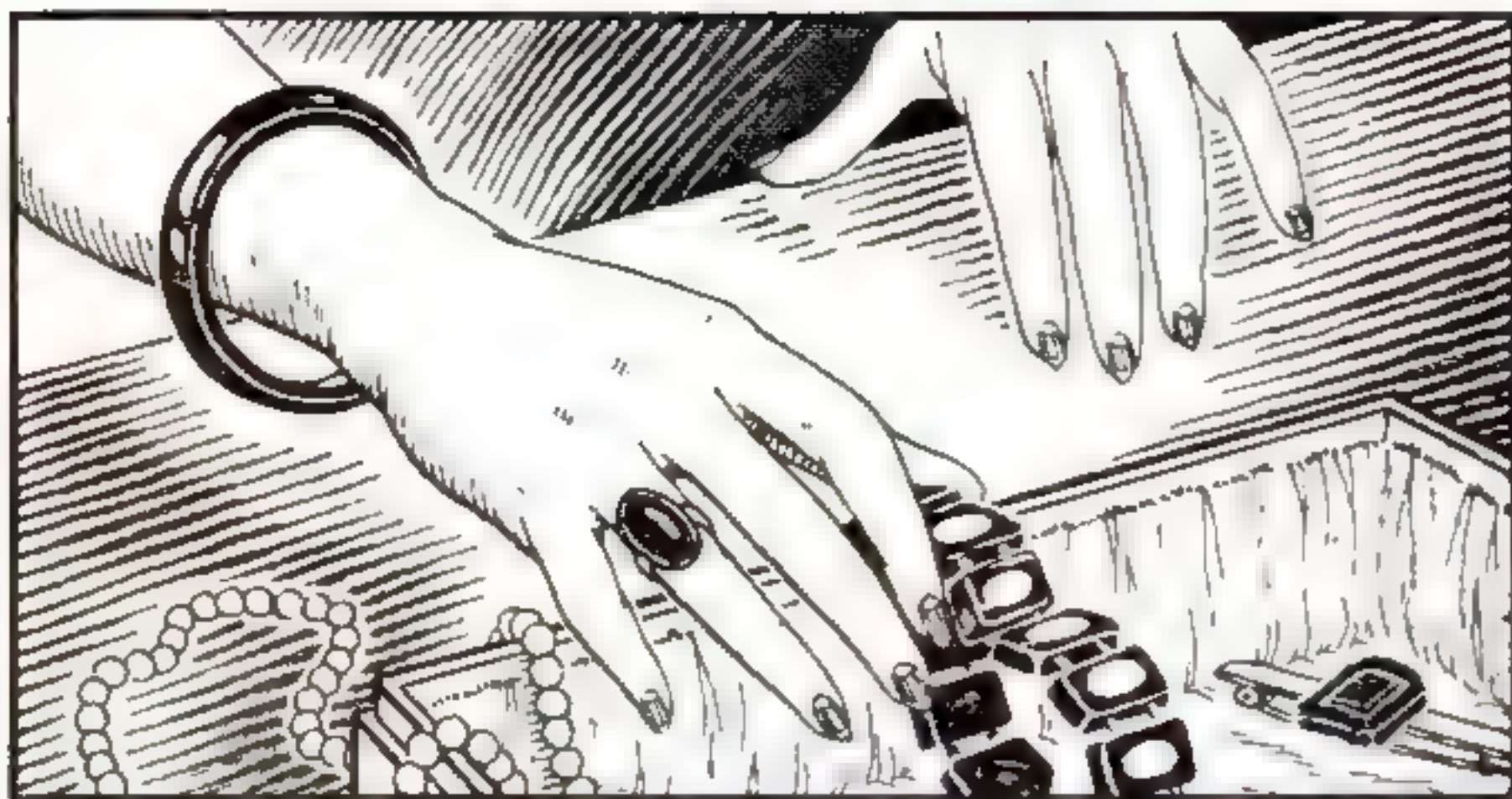
use from fifteen to twenty grams of potassium permanganate and about fifty cubic centimeters of the acid. This proportion uses the permanganate, the more expensive chemical of the two, to the best advantage.

This completes the first cycle of treatment, but the pulp will not yet be nearly as white as a paper maker would desire. The whole round of operations, therefore, should be repeated three or four times in the same order—"digesting" the pulp with hot caustic, washing it by decantation, and bleaching it with chlorine. Finally the bleached pulp should be thoroughly washed with water, poured out in a thin film upon a piece of wire screen, and allowed to dry.

Your product is a sheet of genuine paper,



PAPER, PAINTS, PLASTICS, AND LUBRICANTS ARE MADE •



A GIFT OF MODERN CHEMISTRY

In plastics, man has created new substances that were unknown in the past. With simple equipment and materials you can repeat a historic chemical feat—preparing and molding synthetic resin.



Distilling a mixture of ethylene glycol and phthalic acid anhydride to produce a synthetic resin.

At the left, the plastic is being poured into molds. The oven in the background is used in "curing" it.

the "bibulous" type of which blotters and filters are made. It should have a permanent place among the exhibits in your home laboratory, along with the relics of other experiments that serve as milestones in the progress of your hobby.

In commercial paper making, the pulp is screened off in just the same way. By additional steps such as sizing, filling, and calendering, the paper is adapted for writing purposes.

Would you like to enrich your chemical museum with painted samples of wood, tinted with colorful pigments that you have made for yourself? Though many pigments come directly from the earth, some of the brightest hues originated in the test tube. You will find a number of them surprisingly easy to prepare. Where the strength of a solution is not otherwise specified in the following recipes, use ten grams or so of the chemical, dissolved in about 150 cubic centimeters of water.

To make chrome yellow, mix potassium dichromate solution with a solution of lead acetate or of lead nitrate. Filter off the yellow precipitate. Wash the precipitate well with water while it is still upon the filter paper, and then dry it. The product is lead chromate, popularly called chrome yellow in commercial usage.

A lighter tint may be obtained by dissolving some sodium sulphate in the potassium dichromate solution, before use. Then, when the solution of the lead salt is added, white lead sulphate is formed along with the yellow lead chromate. Filter out the mixed pigment and wash and dry it as before.

Chrome orange or chrome red may be prepared by boiling pure chrome yellow (lead chromate) in a weak solution of an alkali—say, sodium hydroxide or calcium hydroxide. A basic form of lead chromate, with a reddish hue, is the result. Filter out, wash, and dry it.

For Prussian blue, add a solution of potas-

sium ferrocyanide to a solution of ferric chloride or of ferric nitrate. This immediately yields the blue pigment as a precipitate. Or, pour a weakly acidified solution of ferrous sulphate into a solution of potassium ferrocyanide or of sodium ferrocyanide. Filter off the whitish precipitate of ferrous ferrocyanide, and stir it in a beaker of fresh water with about two grams of bleaching powder. Then add hydrochloric acid and boil. This converts the precipitate to ferric ferrocyanide, or Prussian blue. Whichever method of preparation you use, the final procedure of filtering out, washing, and drying is followed.

Cobalt blue will be formed if you make a paste of aluminum oxide with a weak (faint-pink) solution of cobalt chloride or cobalt nitrate, and heat the mixture to a high temperature. A Bunsen or Meker burner, rather than an alcohol lamp, must be used. The longer and more intense the heating, the deeper will be the shade of blue that you obtain. Cobalt aluminate is the chemical name of the pigment.

Brunswick green can be made by mixing, dry, about twelve parts of chrome yellow and one part of Prussian blue.

To make white lead, dissolve twenty grams of lead acetate in 150 cubic centimeters of water. Add fifteen grams of litharge (lead monoxide), and boil the solution. It now contains a soluble, basic form of lead acetate. Filter out and discard any undissolved material. Then bubble carbon dioxide gas through the filtered liquid. You will obtain a precipitate of basic lead carbonate, or white lead,

which should be filtered out, washed, and dried. Carbon dioxide gas for this experiment can be generated in any standard way, such as by the action of hydrochloric acid, diluted with four times its volume of water, upon marble chips or baking soda.

Everyday paints are made from pigments like these by grinding the coloring materials with various oils, thinners, driers, and gums. From any one of the pigments just described, you can make your own paint. First, grind the pigment with a little linseed oil to form a paste. Add a pinch or so of manganese borate powder. Grind the mixture again, and then thin it to the desired consistency with turpentine. Apply your paint to a small panel of wood and allow it to dry for several days.

Even the manganese borate that this recipe calls for may be prepared in your own laboratory. Add a filtered solution of borax to a solution of manganese chloride or of manganese nitrate. The resulting grayish-pink precipitate of manganese borate is washed and dried for use.

As if by magic, you can change ordinary motor oil into stiff cup grease. All you need do is to heat about ninety grams of the oil, or a little less than half a tumblerful, with ten grams of aluminum stearate powder. Stir the mass until it becomes clear. Then let it cool slowly without further stirring. It will form a thick, transparent grease. You can demonstrate its stiffness by placing a heavy weight in it. The weight remains suspended, instead of dropping to the bottom. Lubricants of the type *(Continued on page 248)*



GREASE FROM COMMON LUBRICATING OIL

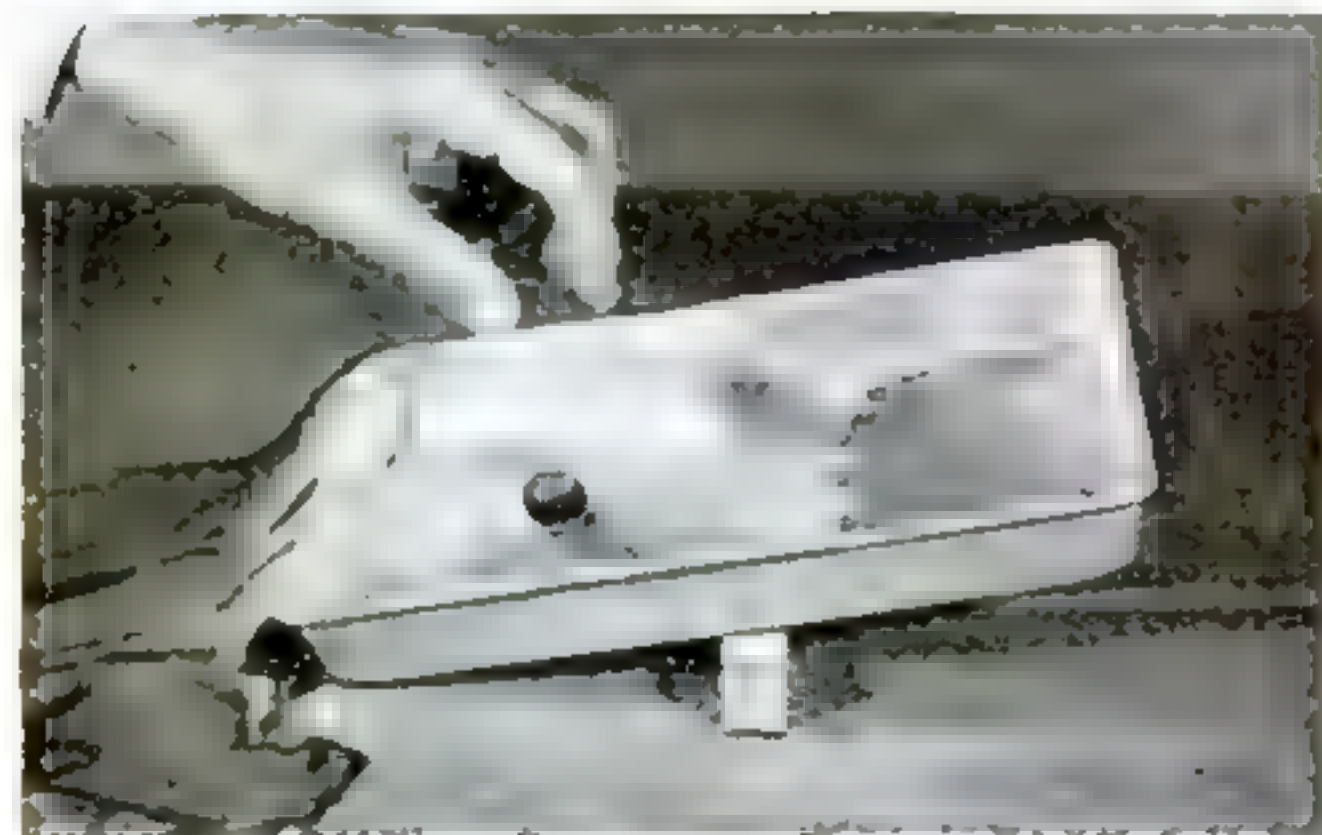
Motor oil is transformed into stiff cup grease by heating it with aluminum stearate powder and allowing it to cool slowly. The resulting grease is so stiff that a weight placed in it remains suspended on top, as shown above. Lubricants of the type known as "aluminum-soap greases" are made in this manner





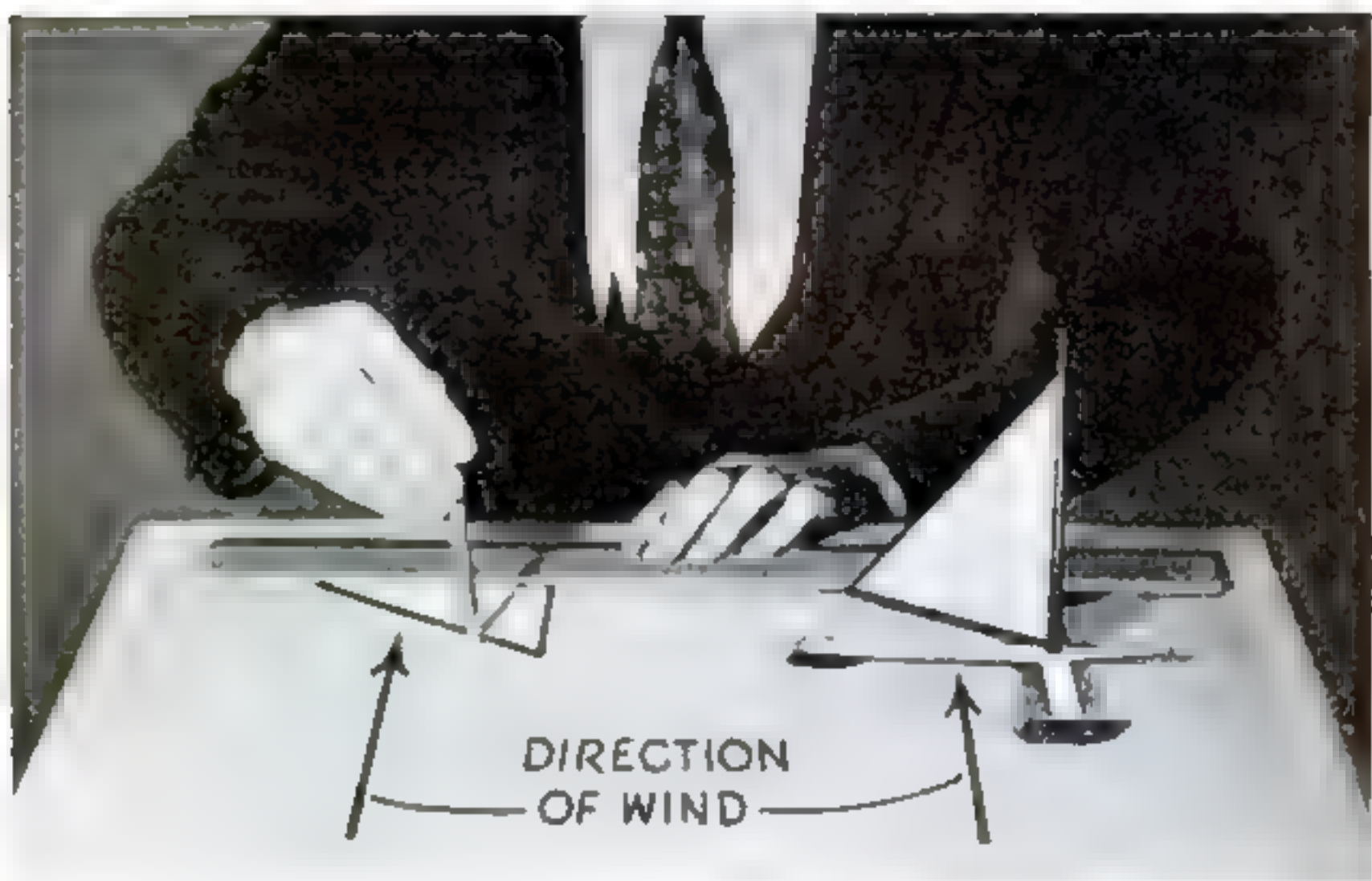
Your Eyes Really See a Topsy-Turvy World

IT'S easy to prove that your eyes, like a camera, give upside-down images. Make a pinhole in a card, and look toward a bright light through the pinhole. Meanwhile, maneuver a pin, head up, close to the eye and against the beam of light from the pinhole. You will see the pin upside down. A simple right-side-up shadow of the pin is formed, and the brain inverts this, just as it inverts the upside-down images normally formed by the lens of the eye on the retina wall.



Easy Tests

A HALF DOZEN NOVEL STUNTS
THAT ARE FUN TO PERFORM



How Ice Boats Outspeed Wind

TO SHOW how ice boats can sail faster than the wind that propels them, cut a cardboard or wooden triangle and press a pencil against it as shown. Forced sideward, the triangle moves much faster than the pencil does. The miniature ice boat in the picture shows how the same thing happens to a real ice boat when the wind strikes the sail at the proper angle to give the greatest possible efficiency in sailing.

This Tray Stays in Balance in Spite of Added Weight

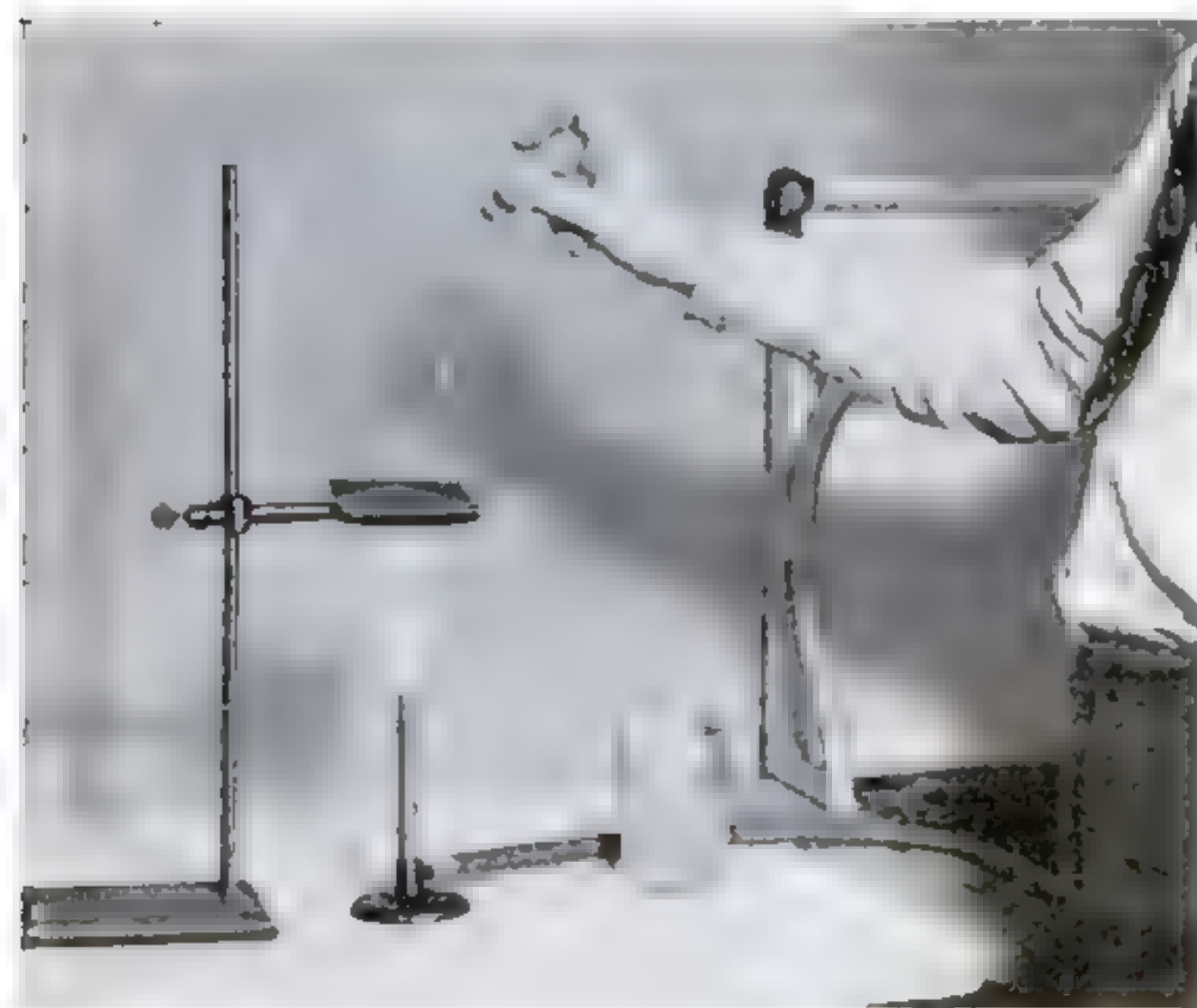
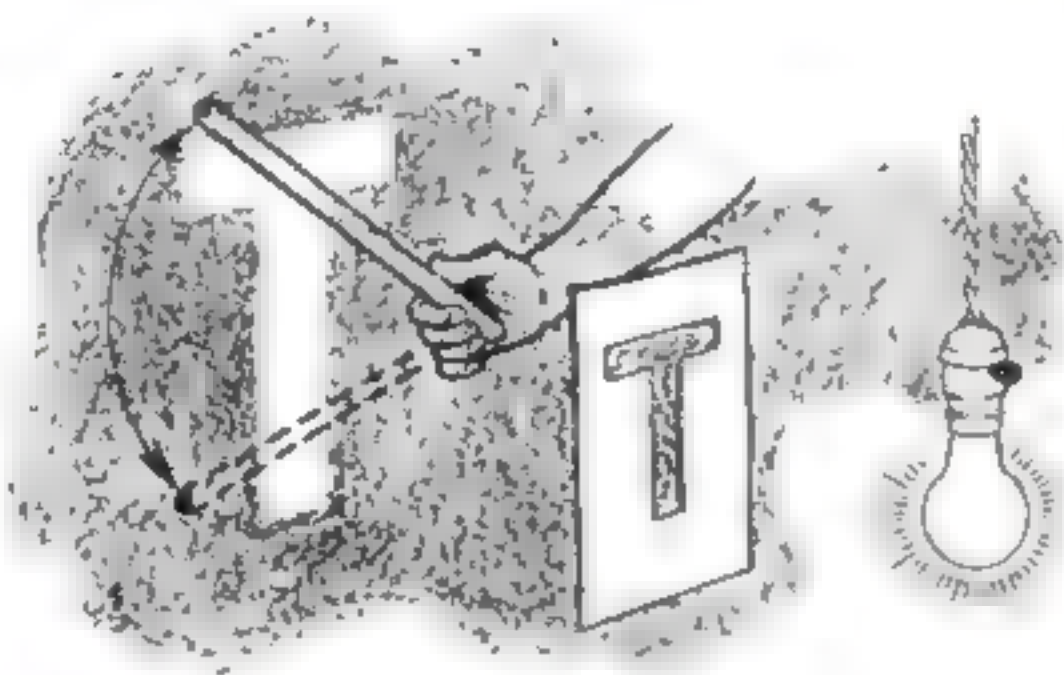
BALANCE a tray of water on the edge of a long block of wood, as shown in the upper view at left. Float a small pan containing a weight in the water. Push the floating pan to any part of the tray, and you will find the balance undisturbed. You can even push down upon the weighted pan, so long as it does not touch bottom, without tipping over the tray. Remove the pan and place the same weight directly in the water, however, and the tray immediately upsets, as shown in the lower view. The explanation of this seeming paradox is that just enough of the water displaced by the loaded pan is shifted to the opposite side of the tray to restore the balance. But the weight cannot displace enough of the water to do this when it is dropped in alone.

Float a weighted pan on a balanced tray of water and it won't upset the tray, but the weight alone will

Prove Scientific Laws

Seeing Things After They're Gone

FOR a fraction of a second, you continue to see a thing after it is gone. This optical phenomenon, applied in motion pictures, is called "persistence of vision." Let sunlight, or light from an electric bulb, shine through a hole of some pronounced shape, say a letter T, in a sheet of paper. Wave a small roll of white paper behind the aperture. You will see a bright T apparently suspended in mid-air, because the eye retains the image of the illuminated wand in every position. If the image is streaky, it indicates that the lamp is operating on alternating current and is therefore flickering on and off many times a second. The fact that you cannot ordinarily see such a lamp flicker is itself another example of the persistence of vision.

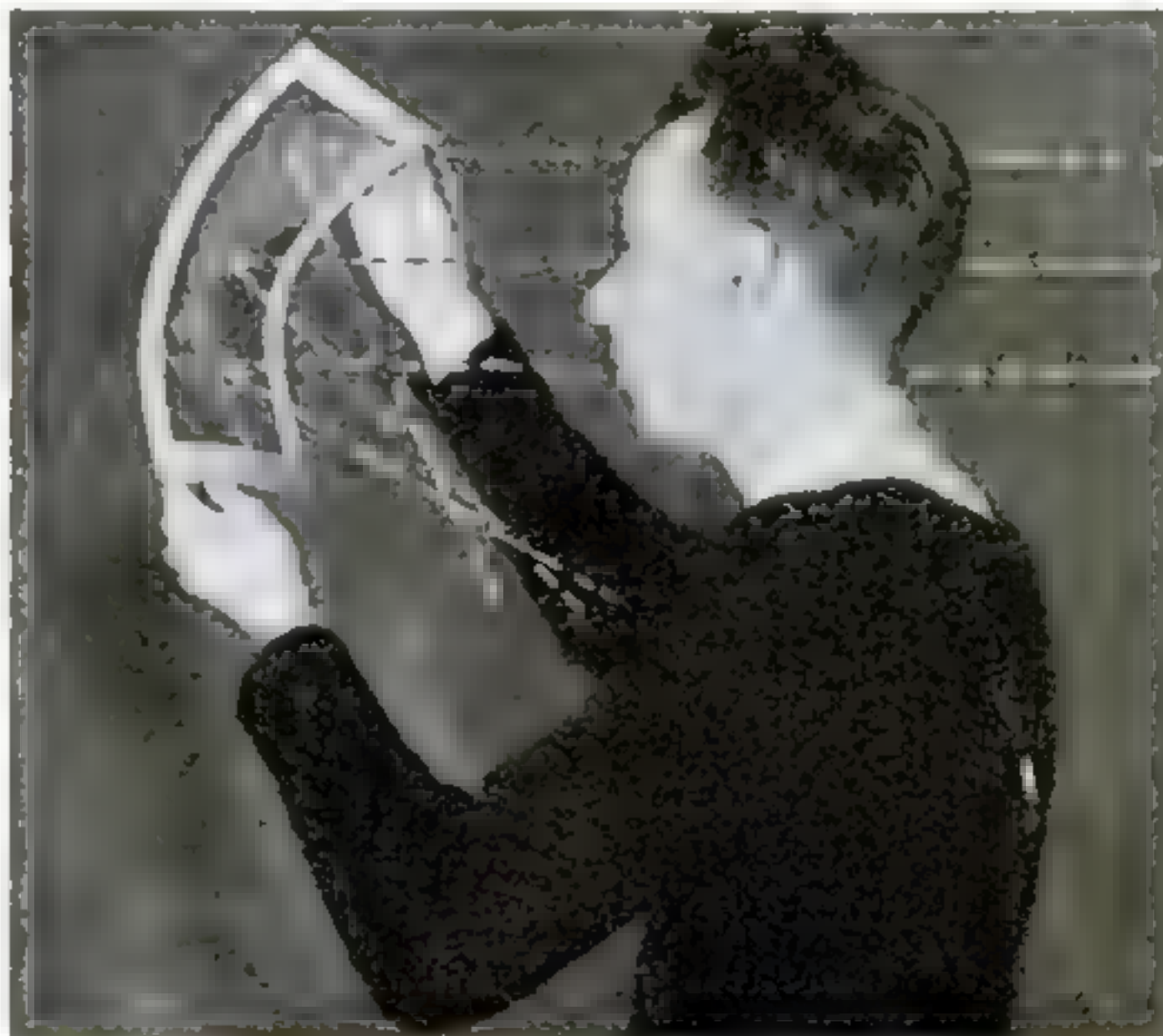


Bending Celluloid Sheet Reduces Reflections

MOUNT a clear, smooth sheet of celluloid or other transparent material in a cardboard frame, and bend it as shown. You will find a curve at which the material seems to reflect no light, and is therefore invisible. Light from the sky or from surrounding objects is reflected at such an angle that it misses your eye. The same principle is applied in shop windows of "invisible glass" (P.S.M., Nov., '35, p. 40).

Simple Apparatus Explains Mysterious Heat Paradox

PLACE a drop of water on a moderately heated sheet of smooth metal, and it will boil away much faster than on a red-hot sheet. At moderate heat, the drop spreads in a thin layer and quickly vaporizes. On the red-hot plate, the drop retains its shape, cushioned by a layer of steam that allows only a small area to touch the glowing metal.





Enabling slides to be shifted accurately under the lens, the easily built mechanical stage illustrated here aids in studying minute specimens like the bacteria in circle

HOMEMADE Mechanical Stage ADDS PRECISION TO YOUR MICROSCOPE

HALF the fun of amateur microscopy is making accessories to help you in the hobby. And of all the things that you can construct, few are more fascinating or more useful than a mechanical stage. Such a stage is a mechanized slide holder mounted on the regular stage of the microscope. By means of micrometer screws or similar controls, the slide can be moved to the right or left, and forward or back, with great precision. By properly combining the

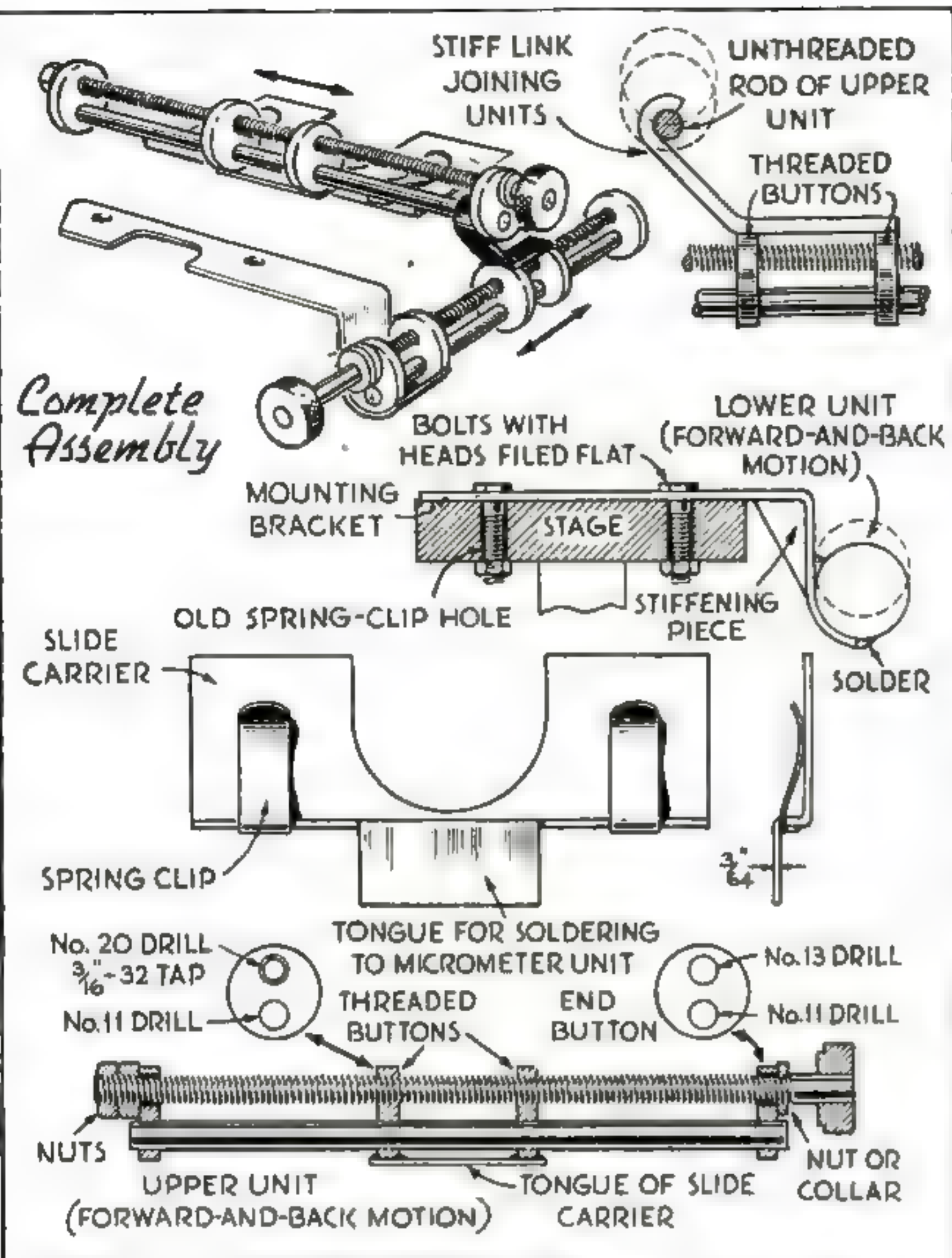
mechanical stage highly useful in observing small details, such as the structure of diatoms, at considerable magnifications. Such a stage is almost a necessity for serious photomicrography. Slides and the specimens they contain are less likely to be damaged when handled mechanically than when moved about beneath spring clips with the fingers.

Although a professional-type mechanical stage costs somewhere in the neighborhood of twenty-five dollars, and all such stages

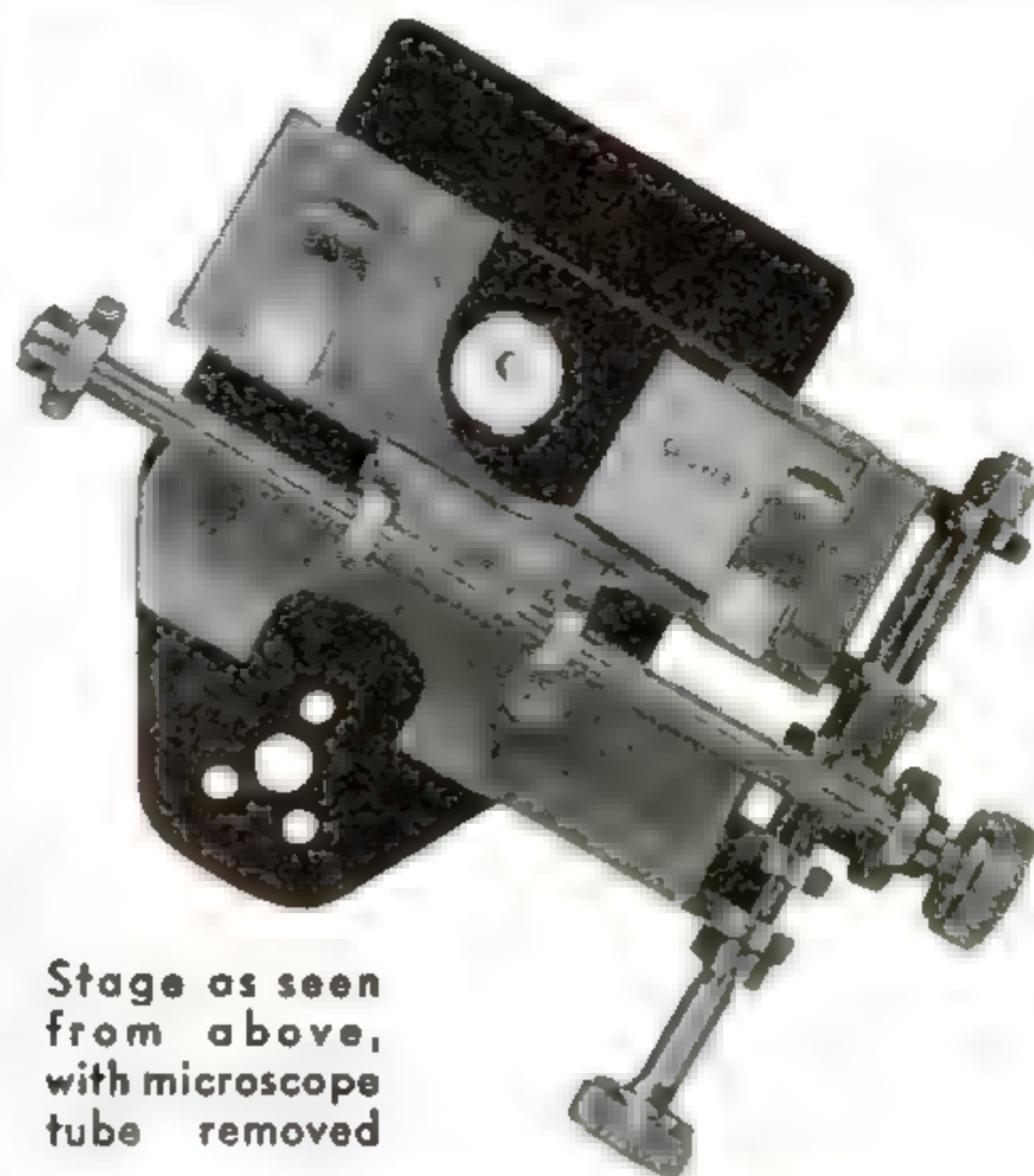


two directions of motion, any point on the slide can be brought accurately beneath the lens. The ability to move the slide very small distances without jerking the object or losing it entirely makes a

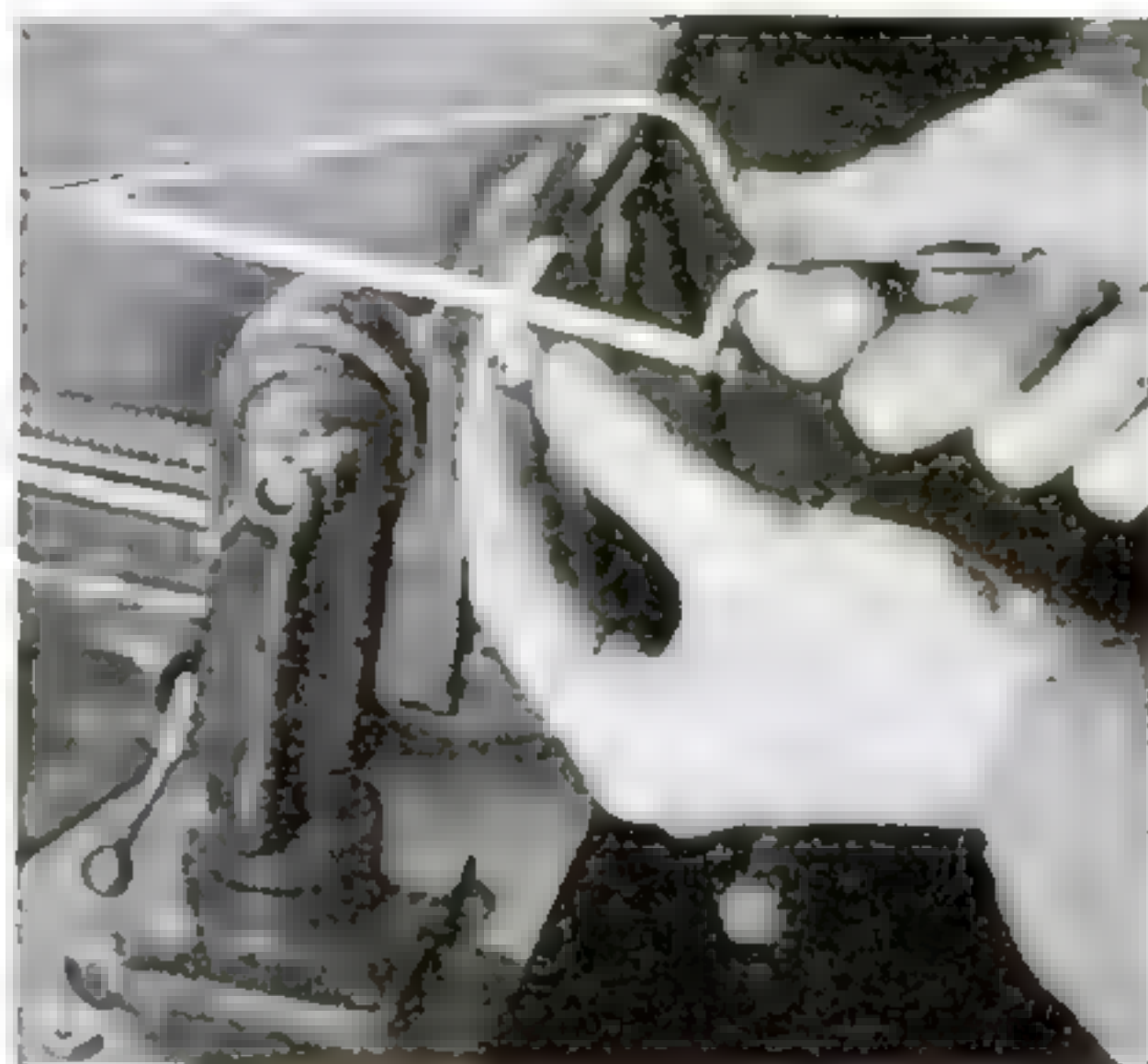
By
MORTON C. WALLING



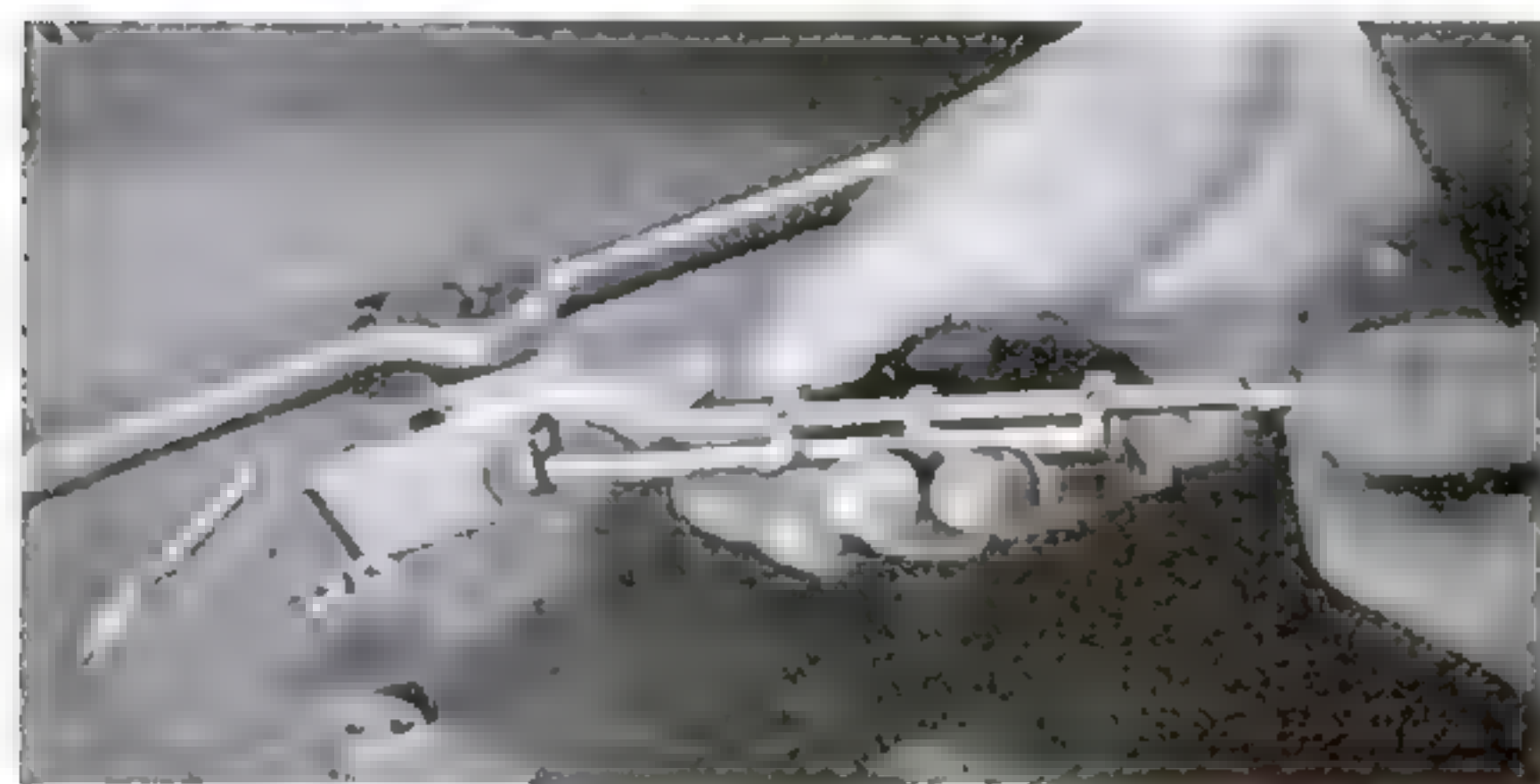
Complete assembly and separate parts required for the stage. Threaded rods with knurled knobs operate the slide carrier



Stage as seen from above, with microscope tube removed



The nine brass buttons required can be sliced from a brass rod that has been properly drilled, as illustrated above. The picture at left shows how the micrometer units are assembled

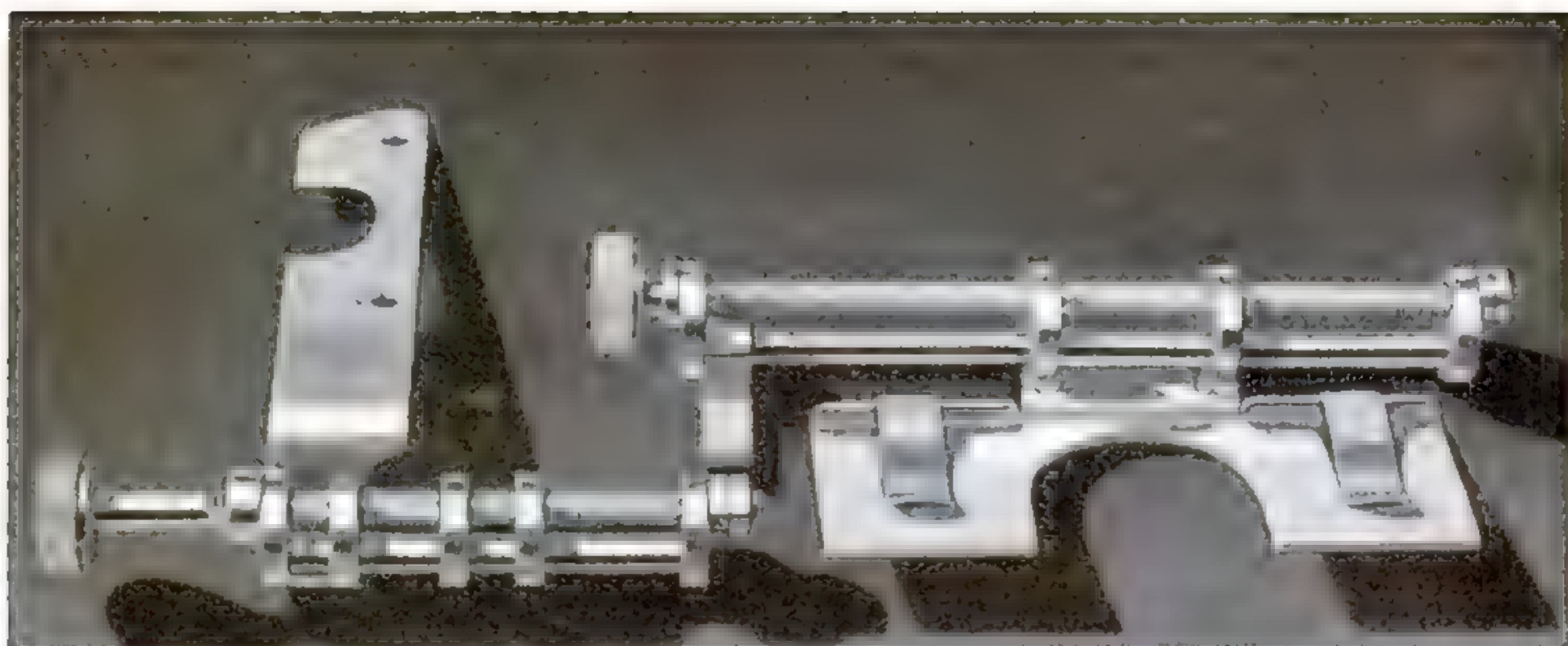


look, at first glance, like highly complicated devices, it is not a difficult or costly matter for the amateur microscopist to make one and fit it to his instrument. The cost for materials will be considerably less than one dollar in most cases, and the tools required are those usually found in the home or small shop. The construction can all be done by hand.

There are various kinds of mechanical stages in use. Those employing racks and pinions for controlling the movements of the slide seem to be most popular with manufacturers; but for the sake of simplicity and ease of construction, the stage to be de-

scribed uses two threaded rods operated by knurled knobs, for shifting the position of the slide carrier. The illustrations show the stage attached to one particular make of amateur microscope. It can, of course, be adapted to fit any other kind of microscope, merely by changing the design of the mounting bracket.

The stage is made entirely of brass, with the exception of the solder used to hold it together. You will need some sheet brass, about $\frac{3}{64}$ " thick, for the slide carrier and mounting arm; about 16" of $\frac{3}{16}$ " brass rod, of which about 8" is to be threaded (standard



Top view of the two micrometer-screw units before being joined together to form the completed stage

3/16" by 32 brass bolts will do, if you can get one 5" and another 3½" long); about three inches of brass rod measuring 9/16" or thereabouts in diameter, and a half dozen brass nuts to fit the threaded rods or bolts.

The two micrometer-screw units, an upper one for controlling right-and-left movement across the microscope stage, and a lower unit for controlling movement in directions at right angles to the first, consist each of a length of the 3/16" rod, a slightly longer threaded rod, and four or five brass disks or buttons, arranged as shown. Each threaded rod is equipped with a knurled knob, which can be a small radio knob, a large binding-post nut, or similar knob; and with three nuts to prevent the rod from shifting endwise.

Since you probably will have trouble locating bolts of sufficient threaded length, you had better figure on threading some of the brass rod yourself. You can obtain a 3/16" by 32 die for a dime, and a suitable holder or stock for a like amount. You will need also a tap of similar size, for threading holes in the brass buttons. It will cost the same as the die, and can be mounted in the chuck of a hand drill or drill press if no regular tap wrench is available. (When using a tap in a drill press, turn it by hand, and not by power.)

First, for the upper or crosswise micrometer unit: Cut a 4¾" length of the 3/16" rod, and thread it for about 4¾". Cut another piece of rod 4½" long, but do not thread it. Next make the brass buttons. You will need nine of these in all, four for the crosswise micrometer unit, and five for the other unit. To make the buttons, square one end of the large (9/16") brass rod, and drill two holes lengthwise in it, diametrically opposite each other, and each centered halfway between the center and circumference of the rod end. For one hole, use a drill bit

slightly smaller than the 3/16" rod. For the other, use a No. 20 bit, which is the right size for threading with the 3/16" by 32 tap. With a hack saw, slice nine sections ⅛" long from the rod. Each section becomes a button ⅛" thick and 9/16" in diameter, with two holes in it. Smooth the buttons with a file.

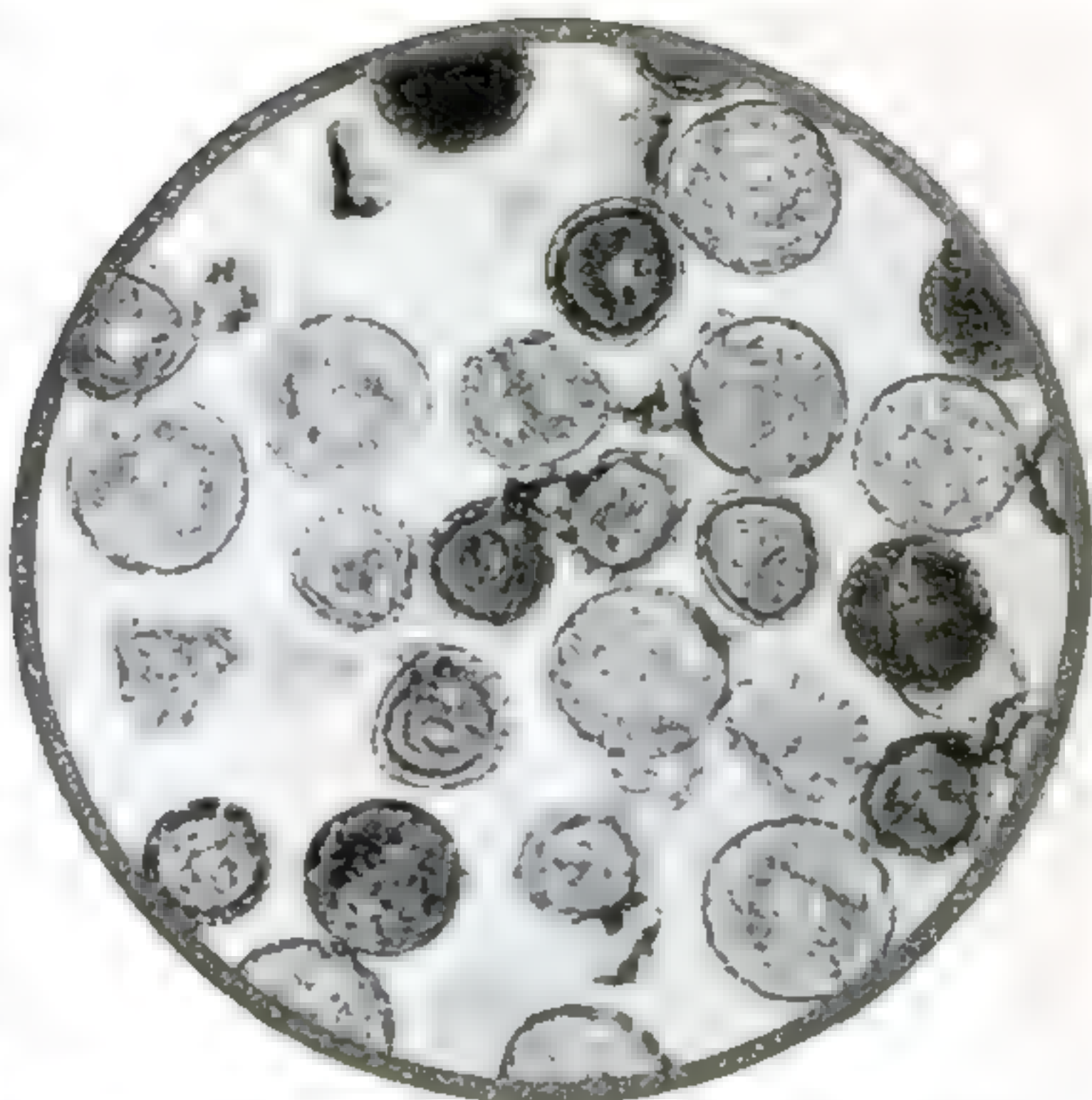
RETURNING to the upper micrometer unit, two of the buttons serve as end pieces to hold the two sections of rod parallel. With a No. 11 drill bit, bore out the smaller holes in these two buttons to permit the threaded rod to slide freely through them. Select two more buttons, and instead of boring out the smaller holes, thread them with the tap (you can thread these holes before slicing the buttons from the stock, if you wish). With the No. 11 bit, enlarge the other two holes of the threaded buttons, so they will slide freely over the unthreaded rod. To assemble the unit, drive one end of the unthreaded rod into the smaller hole of one of the unthreaded buttons, making sure that the fit is tight enough to hold. You can rivet or punch-mark the end of the rod to make it tight, if any looseness is evident. Next slide the two threaded buttons over the rod, being sure that they slide freely without a trace of binding, and finally drive the second unthreaded button on the remaining end of the unthreaded rod. Make sure that the holes of the end buttons are exactly aligned. This is done most easily by inserting the threaded rod through the holes of the end buttons, letting the threaded buttons swing down out of the way, and sighting along the rods to determine when they are parallel. When installing the threaded rod finally, screw a nut on it until it jams against the unthreaded portion at the knob end. Insert the rod, running it through the two threaded buttons, which are spaced ¾" to 1" apart, and letting the end project through the hole in the opposite

Build This Mechanized Slide Holder And See How Much It Improves Your Instrument for Photomicrography and for Observing Small Details

end piece. Run a nut on this end, until it fits snugly against the end piece but does not bind when the threaded rod is rotated, and then run a second nut tightly against the first one, to lock it in place.

The lower micrometer screw unit, for controlling forward-and-back motion of the slide carrier, is made exactly like the first, with these exceptions: Length of the unthreaded rod is $2\frac{1}{8}$ ". Length of the threaded rod is $3\frac{1}{2}$ ", of which $2\frac{5}{8}$ " is threaded. There are five buttons instead of four, the extra one, with holes enlarged with a No. 11 drill bit, being placed about $\frac{1}{2}$ " from that forming the end piece nearer the knurled knob, to provide stiffness.

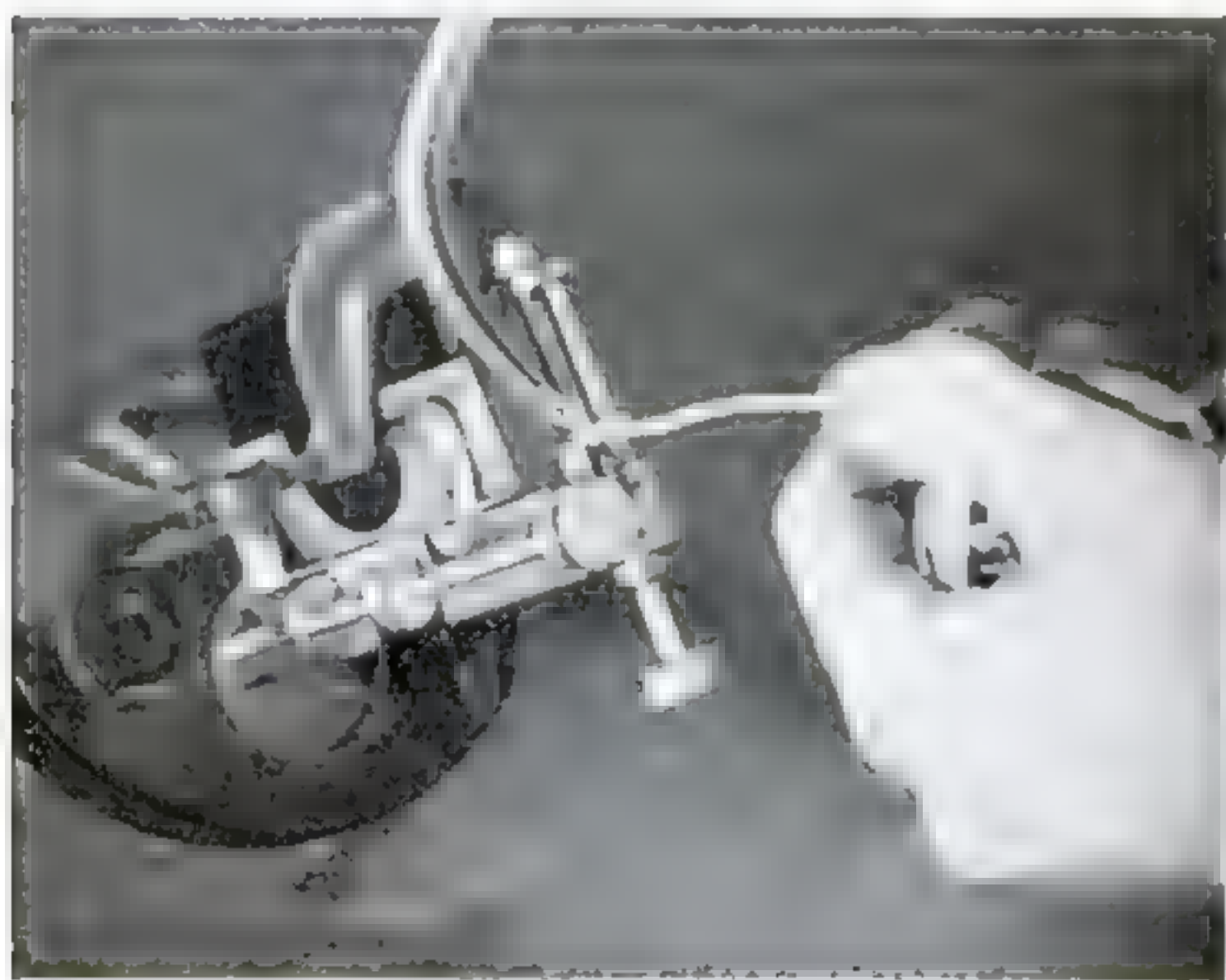
The slide carrier consists of a plate made of sheet brass and shaped as shown, and provided with two spring-brass or bronze clips measuring $\frac{5}{16}$ " by 1", with $\frac{1}{8}$ " bent over for soldering to the turned-up rear edge of the carrier. The opening in the center of the carrier is about $1\frac{1}{4}$ " wide, and 1" deep. The tongue projecting back from the carrier measures about $\frac{1}{2}$ " by $1\frac{1}{8}$ ", and is soldered to the bottoms of the two threaded buttons of the crosswise micrometer unit. Make sure that the micrometer-screw unit is square with the slide holder, and that the two rods



Pollen grains, best observed with a mechanical stage

are in a vertical plane, the threaded one uppermost.

The design of the mounting bracket by which the second micrometer unit is attached to the microscope stage depends, of course, on the shape of the stage and positions of holes by which the bracket can be mounted, if any. The microscope shown has two holes for the original spring slide clips, which were employed for mounting the mechanical stage, with the aid of two 6" by 32 brass bolts whose heads were filed flat, to permit the slide carrier to clear them. Whatever the shape of the mounting bracket, which is made of sheet brass $\frac{3}{64}$ " thick or thereabouts, bend the projecting end of it downward, with *(Continued on page 246)*



Soldering the link that connects the two screw units. At the right, the completed stage is being fastened to the regular microscope stage by bolts through clip holes

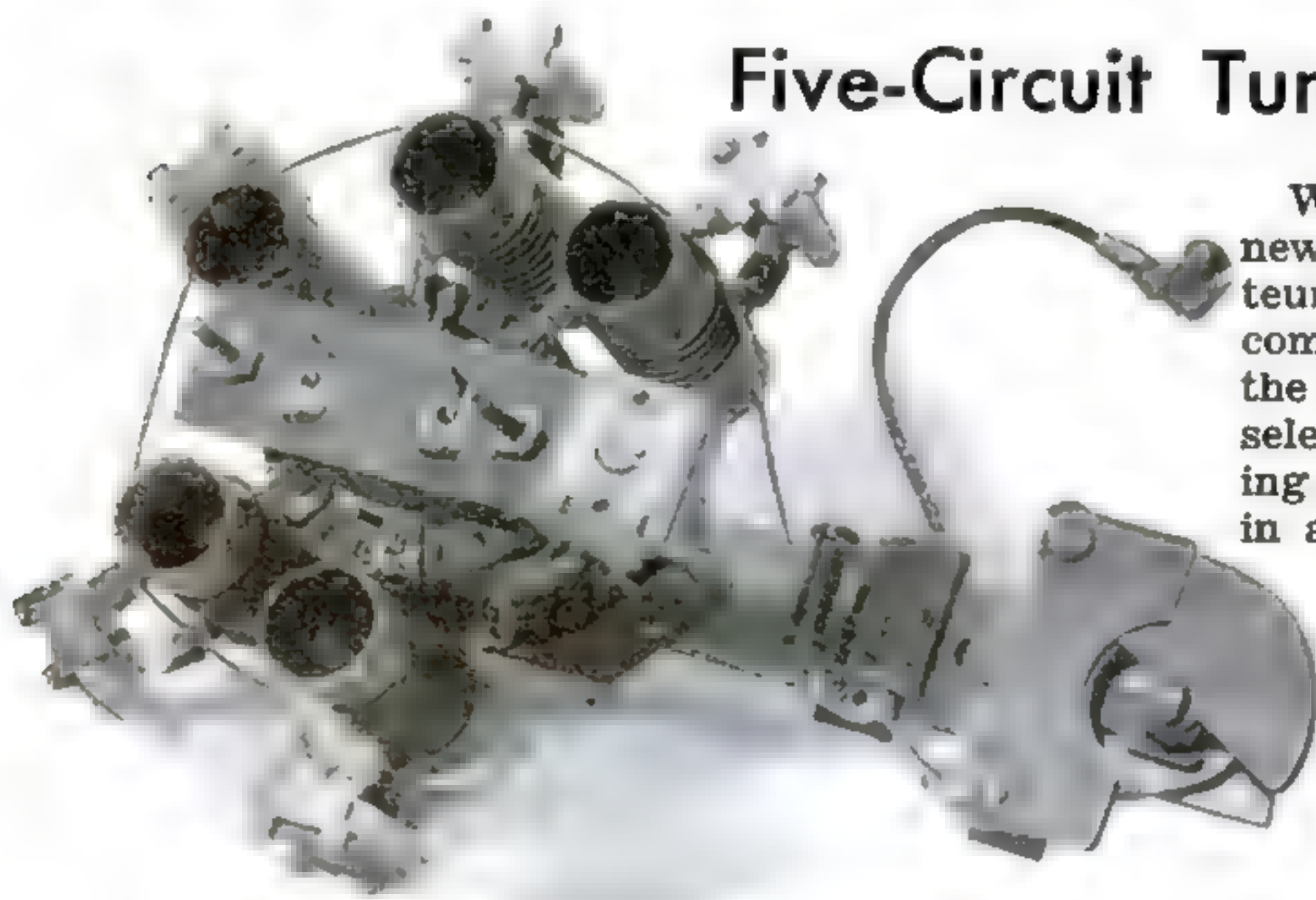


Casters allow this radio to be moved from room to room



Mobile Radio-Phonograph

MOUNTED on rubber-tired wheels so that it can be easily trundled from one room to another, a new radio-phonograph combination can also be used as a rolling table. Radio controls and the phonograph turntable are reached by raising one end of the cabinet's flat top and sliding the other end outward, as seen above.



A switch replaces plug-in coils on the five-wave-band unit

Timely Ideas

Tiny Vacuum Condenser Made for Transmitters

USING vacuum as an insulating agent, a new transmitting condenser has an over-all length of less than seven inches and a maximum diameter of two inches, yet it is rated at voltages up to 3,000 volts. The unit consists of two concentric cylinders inclosed in a vacuum tube. Tuning is effected through a variable condenser connected across a few turns of the inductance.

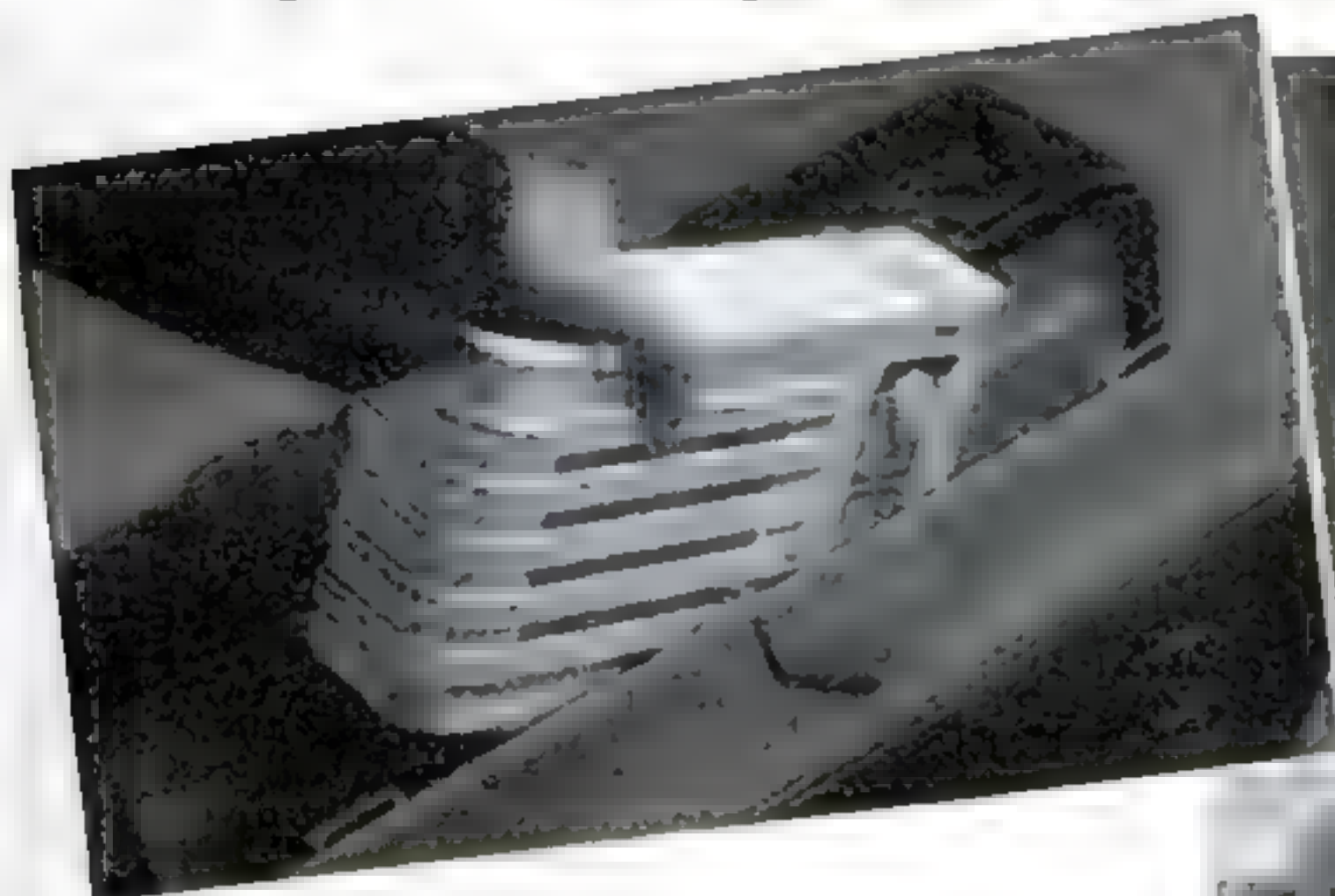


How new vacuum-type transmitter condenser (held in hand) compares in size with old type

Five-Circuit Tuner Has Many Uses

WIDE adaptability is the keynote of a new tuning unit designed for radio-amateur use. The apparatus consists of five complete tuning circuits, one for each of the amateur bands. Any band may be selected by the operator merely by turning a switch. The tuner can be employed in a portable receiver to make it truly compact and efficient, as an all-wave signal generator, in a preselector for superheterodyne receivers, or as a signal-strength or wave meter. Other units of similar construction, now available, may be used as exciter units in transmitters because of their rapid band-changing facilities.

for Radio Amateurs



Ultra-Thin Radio Fits in Close Quarters

WITH a molded cabinet of plastic material in either a green, black, or ivory shade, a small radio now on the market can be laid either flat or upright on a table, or hung on a wall, as pictured at the right, above. Exceptionally thin, the receiver occupies little space and can be easily packed into an overnight bag. The set employs a five-tube superhet-



Thin enough to fit in your suitcase, the compact receiver may also be hung flat against a wall or placed on top of a table

erodyne circuit covering the broadcast band from 500 to 1,500 kilocycles. Excellent volume and tone are obtained with the compact receiver, it is said.



When the radio is not in use, its retractable dial folds into the top of the cabinet as shown at right

Set Has Disappearing Dial

A RETRACTABLE tuning dial that disappears into the top of the radio cabinet is an odd feature of a ten-tube superheterodyne receiver recently displayed in Europe. Indirect illumination is automatically switched on when the dial is raised out of the cabinet. Tuning knobs are placed on the cabinet face.

Soldering-Iron Control Prevents Overheating

THE flow of current to an electric soldering iron can be adjusted to suit any condition, and thus prevent overheating and consequent damage to the iron, with a voltage-regulating device now available. Compact in size, the unit which has a plug for the iron is simply screwed into an electric outlet.

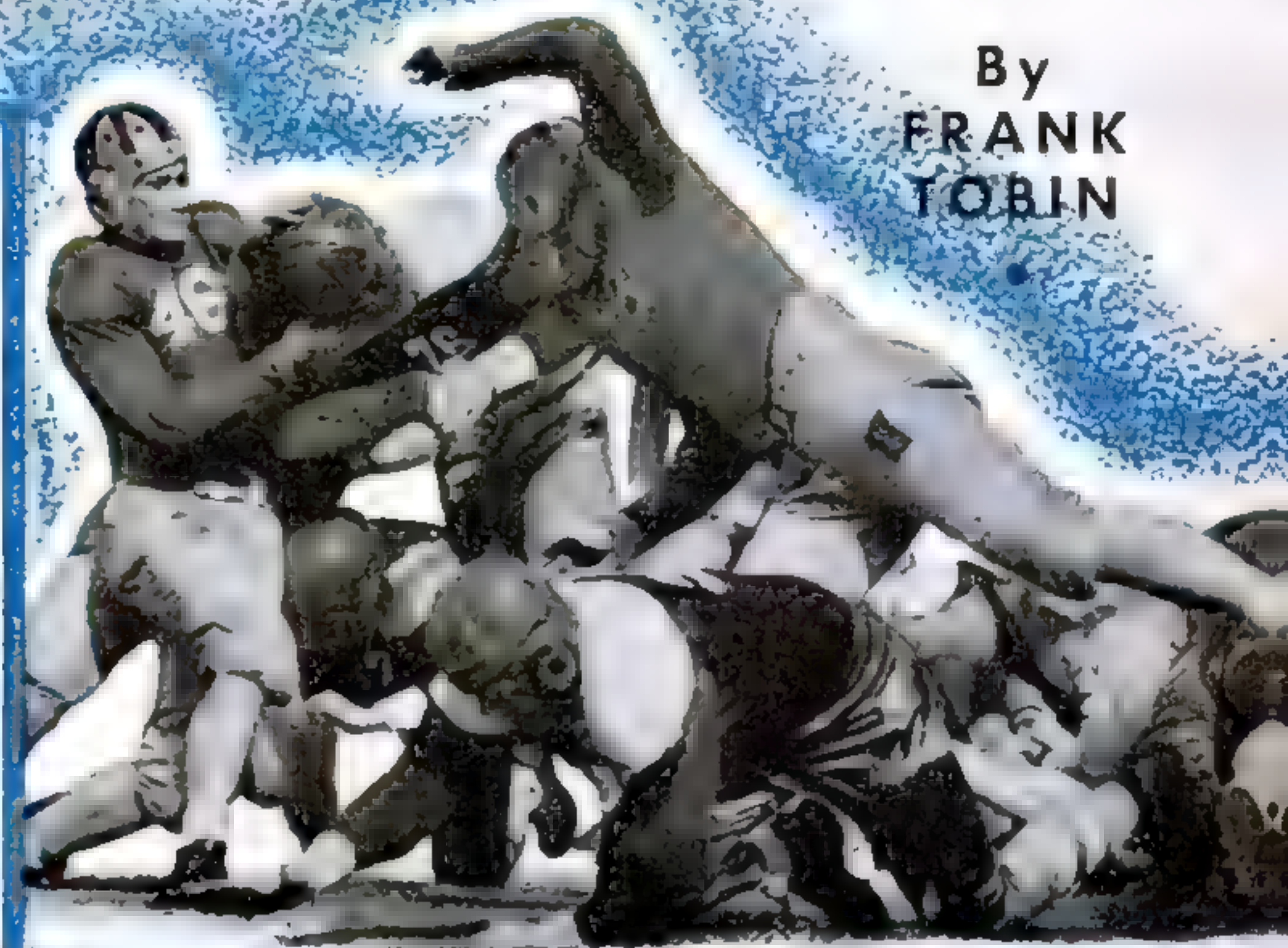


This new voltage-control unit for electric soldering irons fits standard socket outlets

Football-Fan's Radio

WITH THIS COMPACT RECEIVER, YOU CAN LISTEN TO
THE BIG-GAME BROADCAST AS YOU WATCH THE PLAYS

By
**FRANK
TOBIN**



HOW would you like to hear a play-by-play radio description of the football games you see—while you're seeing them? All you have to do is build the compact radio receiver described on these pages, take it with you to the next big game, and tune in on the radio broadcast of the game while you watch. When the final whistle blows, you'll know a lot more about the plays you saw than will your neighbors in the football stands.

The cabinet of the receiver, designed to look like a vacuum bottle, is compact enough to be carried under the arm, and contains both the receiver circuit and the batteries. Open at one end and closed at the other, it measures 4½" by

Handy for picnics as well as football games, this compact receiver gives good earphone broadcast reception



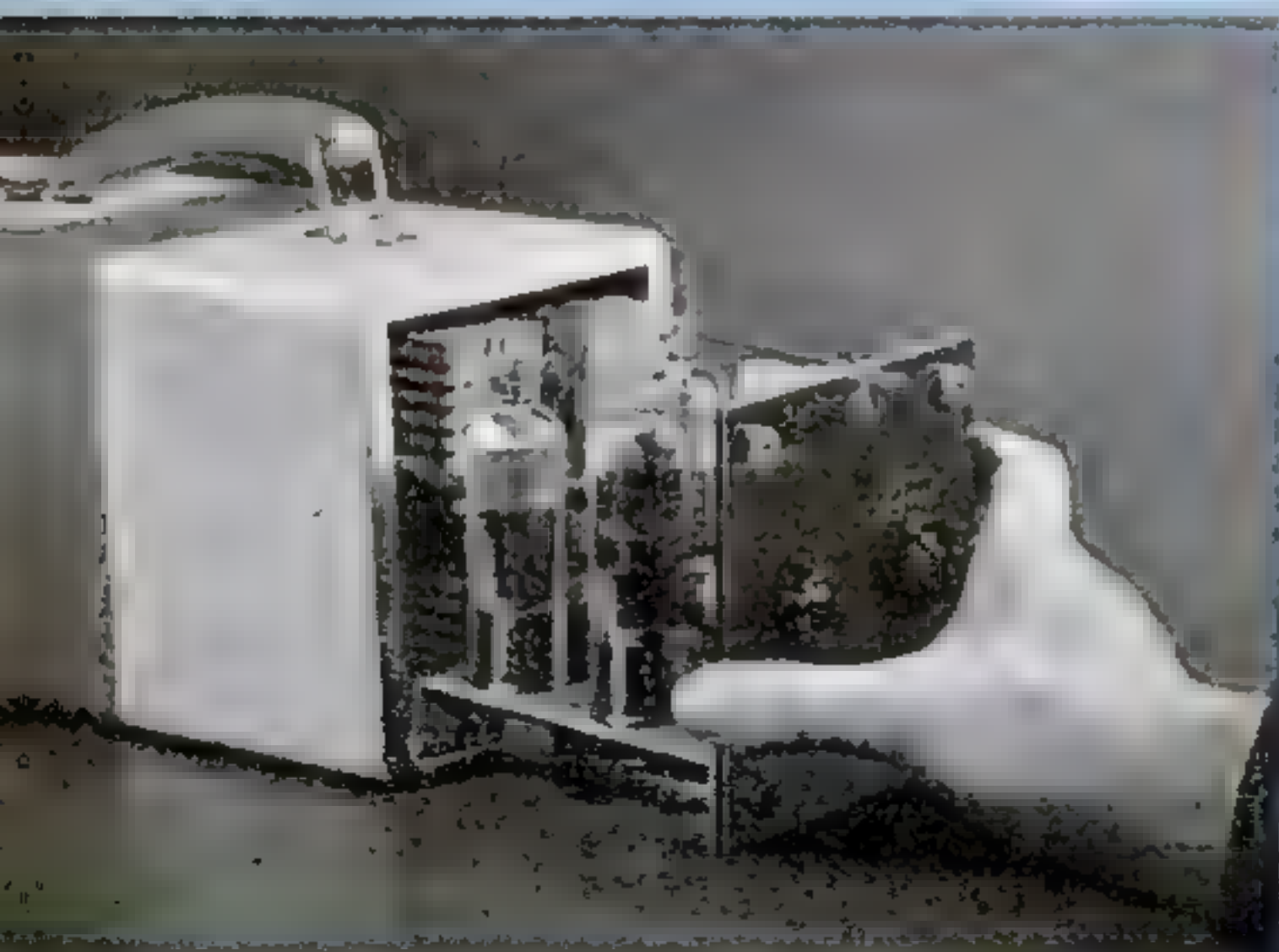
Several spectators at a football game can use this receiver at once. Compact and provided with a convenient handle, the receiver has its own built-in battery supply, and operates on a short antenna

5" by 10" and is constructed of pine $\frac{3}{8}$ " thick. Shellac can be used to seal the grain, while a few coats of enamel provide a durable and attractive finish. If desired, the case can be finished in the colors of the builder's favorite school or college.

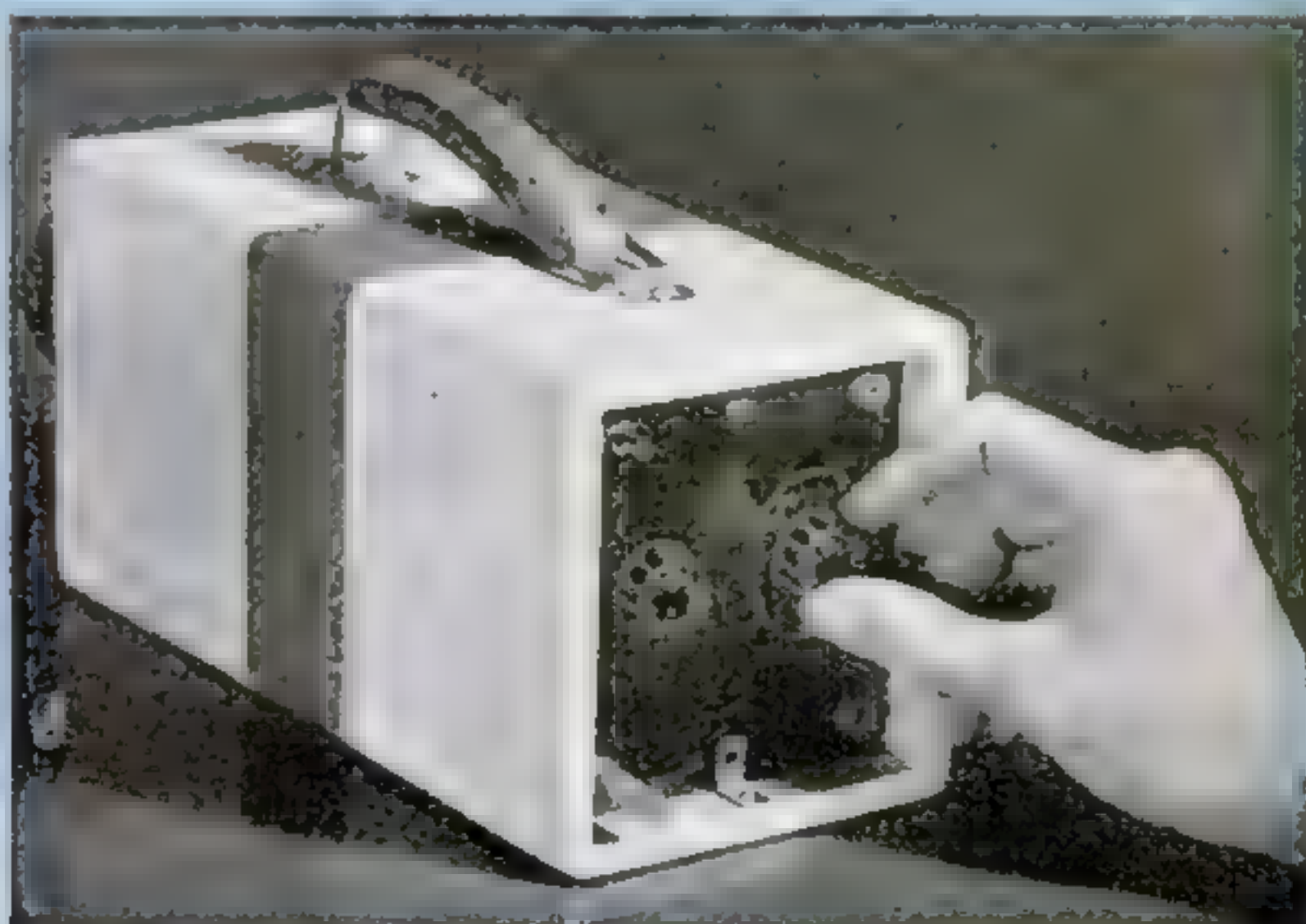
To complete the realistic appearance of the outfit, the cap from a regular vacuum bottle is fastened to the closed end of the cabinet. This can be bolted permanently in place, or, as was done in the original shown, it can be used to house additional plastic

drinking cups. If this is done, a disk of wood shaped to be a snug fit in the outer cap must be bolted to the cabinet. If a particularly neat job is desired, coarse threads can be cut into the wood disk to take the threads on the inside of the cap.

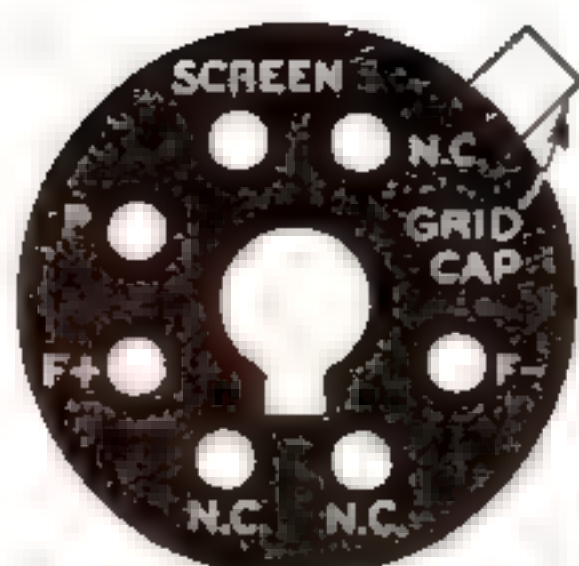
The circuit chosen is a standard three-tube, tuned-radio-frequency hook-up. However, instead of using 2-volt battery tubes, the author decided to employ the new $1\frac{1}{2}$ -volt tubes, because of their extremely low filament consumption. The parts are mounted



Batteries and circuit are slipped into the open end of the cabinet. The chassis holds the batteries in place



To allow the vacuum-bottle cabinet to stand upright, the control panel should be recessed, as shown above

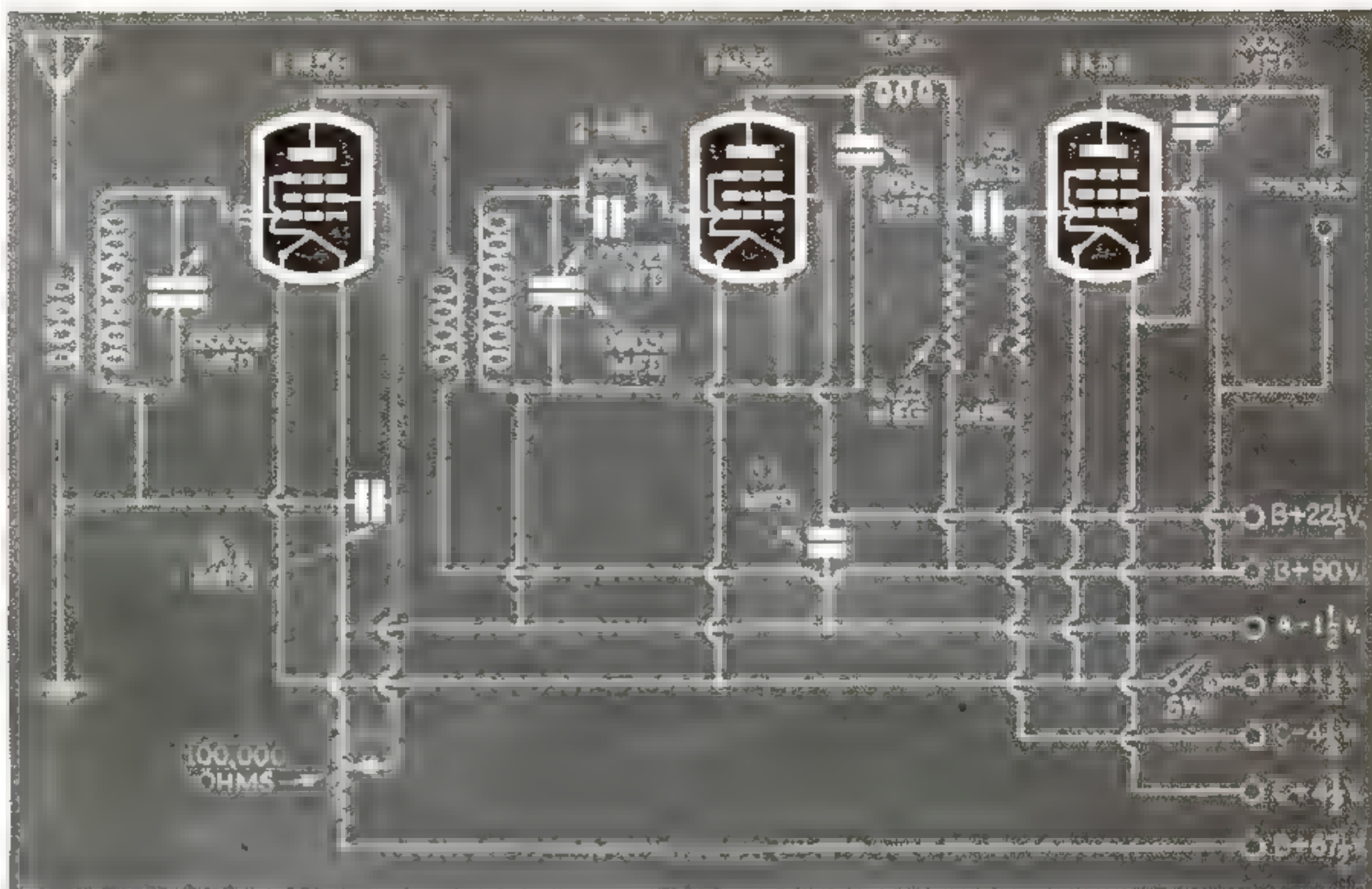


1N5G (BOTTOM VIEW)
N.C.—NO CONNECTION



1A5G (BOTTOM VIEW)

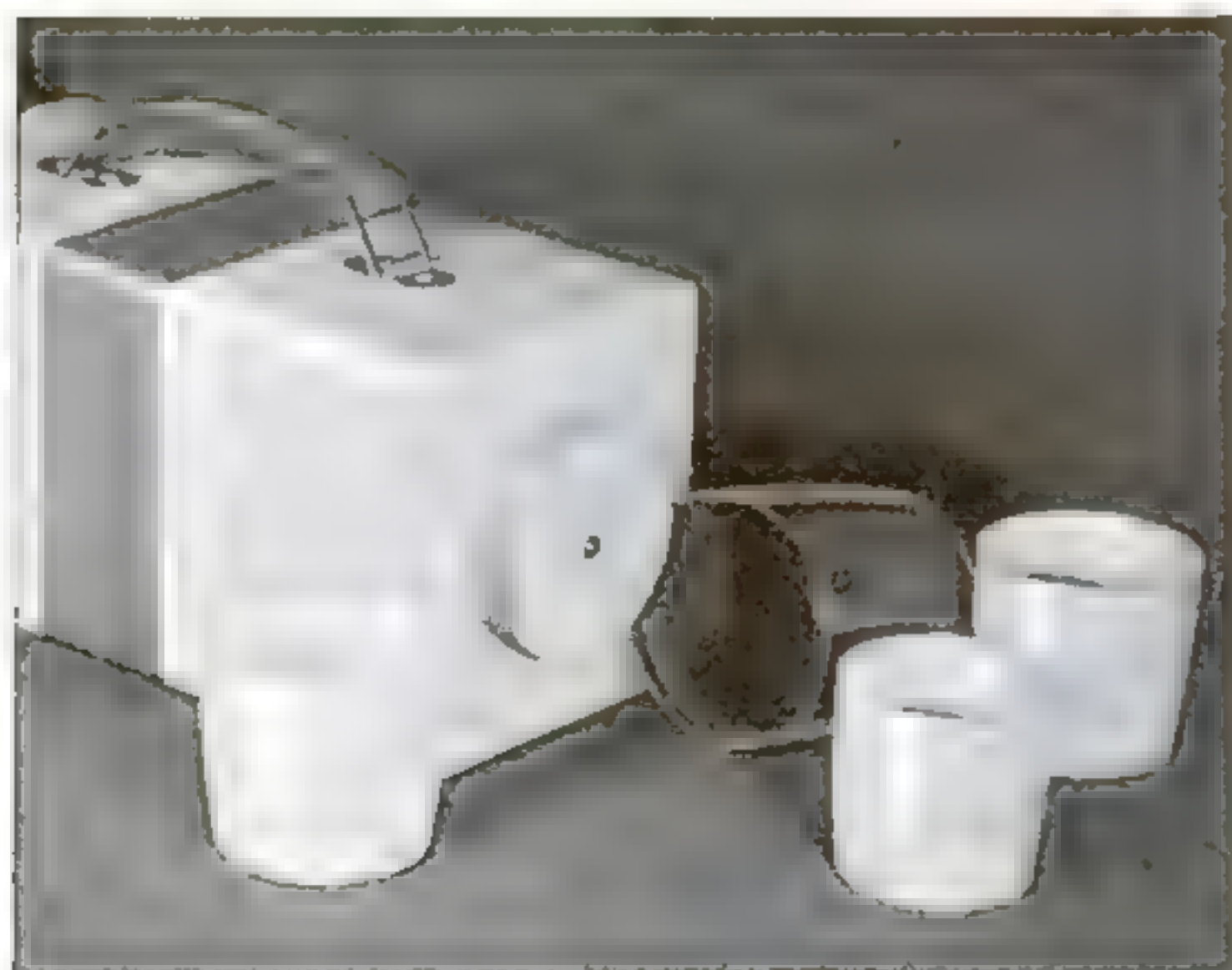
Tube-base diagrams showing the connections to be made for the tubes used in the circuit



Wire the circuit carefully and make sure that all soldered connections are tight

on a midget aluminum chassis measuring 1" by 4 1/2" by 4 1/2".

A two-gang variable condenser is used to tune the radio-frequency and detector stages, and a small radio-frequency choke in the plate circuit of the detector tube prevents any stray radio-frequency currents from entering the audio-frequency stage and causing distortion. The antenna coil, a regular commercial unit removed from its shielding can, can be mounted directly onto the back of the control panel just above the two-gang tuning condenser. The radio-frequency coil, which should be shielded, is mounted between the two pentode tubes. A 100,000-ohm variable resistor inserted in the screen lead to the radio-frequency tube controls the volume of the receiver by varying the screen voltage to that particular tube.



If a wood disk is used to hold the cap in place, additional cups can be carried inside the cap

The "A," "B," and "C" batteries, bound together with a heavy black elastic band, can be slipped into the cabinet after being connected up to the six-way battery cable of the receiver. The set is then placed inside of the cabinet in front of the batteries, and anchored securely in position by four small brackets. Four insulated plugs mounted on the face of the control panel provide connections for the antenna, ground, and phones. A twenty-five-foot antenna, of the type commonly used with small A.C.-D.C. receivers, is recommended.

LIST OF PARTS NEEDED

- Two 1N5G tubes.
- One 1A5G tube.
- Two-gang condenser, .00036 mfd.
- Two tubular condensers, .1 mfd.
- Tubular condenser, .05 mfd.
- Mica condenser, .003 mfd.
- Mica condenser, .0005 mfd.
- Mica condenser, .00025 mfd.
- Resistor, 2 meg., 1/2 watt.
- Resistor, 1 meg., 1/2 watt.
- Resistor, 250,000 ohm, 1/2 watt.
- Radio-frequency choke.
- Radio-frequency coil.
- Antenna coil.
- Three octal sockets.
- Switch and volume control.
- Six-way battery cable.

Miscellaneous:—Four banana plugs and jacks, dials, knobs, batteries, chassis, cabinet, panel, earphones, etc.

Pocket Radio

BUILT INTO A Notebook



A one-tube receiver that is small enough to be carried in your coat pocket. How the parts are mounted inside the book cover is shown at right

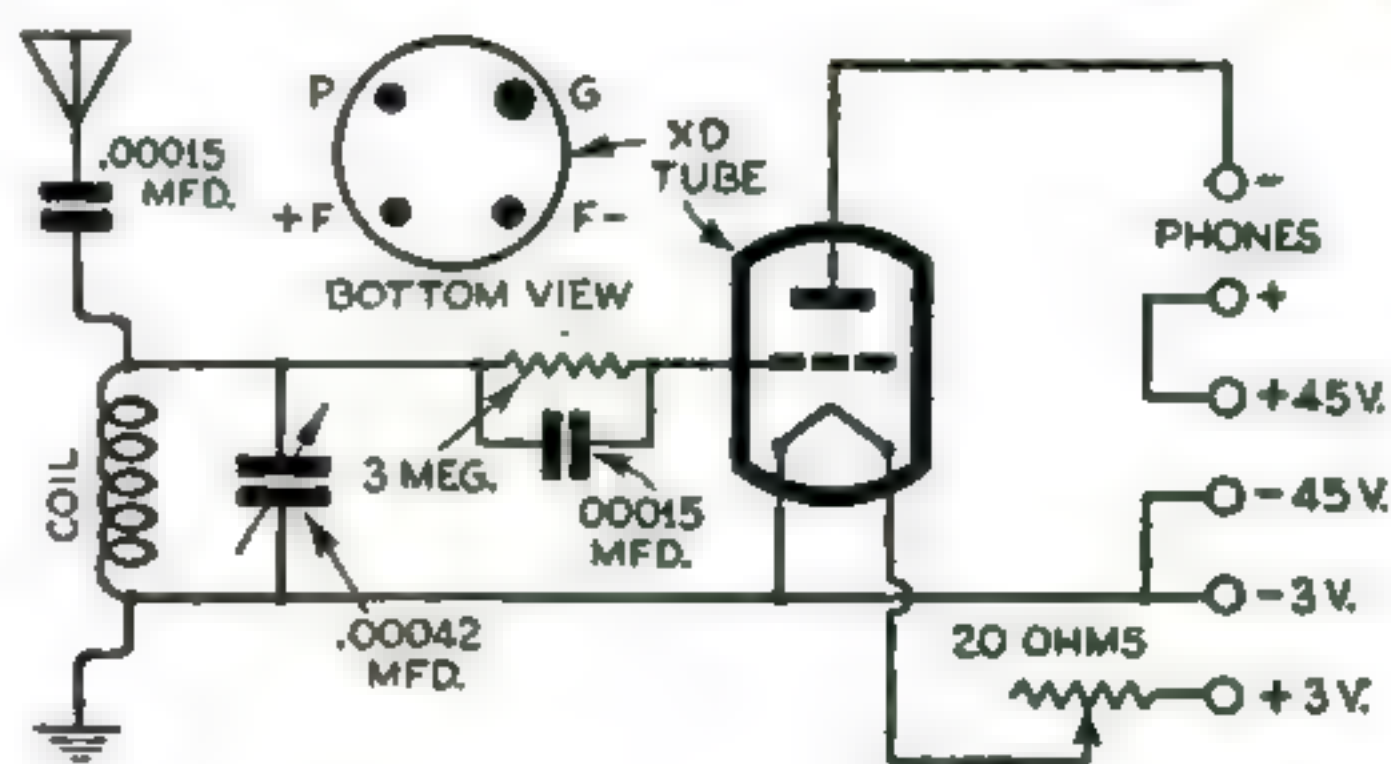
BUILT into a 3" by 4" loose-leaf notebook, this tiny one-tube, earphone radio can be carried easily in your coat pocket. Its single tube, a midget triode measuring less than 3", requires but 3 volts for its filament and 45 volts for its plate.

Because of limited space, no socket is used, connections being soldered directly to the pins at the base, and the tube is sewed to the front cover to hold it in place.

A small, .00042-mfd. insulation-spaced variable condenser tunes the set. It measures 1¼" square, and has a depth behind the cover of only ⅜".

The tuning coil is a high-impedance primary coil of the type used to replace burned-out primary windings in standard A.C.-D.C. receivers. However, you must unwind approximately 100 turns to make the coil suitable for receiving stations between 200 and 550 meters.

Current is supplied by the new midget "A" and "B" batteries, also small enough to fit in your coat pocket, and four small jacks provide connections for the antenna, ground, and phones.



LIST OF PARTS NEEDED

MIDGET tuning condenser, .00042 mfd., paper-spaced instead of air-spaced. High-impedance primary coil. Two mica condensers, .00015 mfd. each. Resistor, 3 meg., ½ watt. Midget detector tube (see text). Rheostat, 20 ohms. Midget 45-volt "B" battery. Midget 3-volt "A" battery. Battery cable, three-way, about 3' long. Four jacks and plugs. Five soldering lugs. Small black loose-leaf notebook. Earphones, dial, knob, etc.

Tricks for Car Owners

Driveway Kept Private by False Barrier

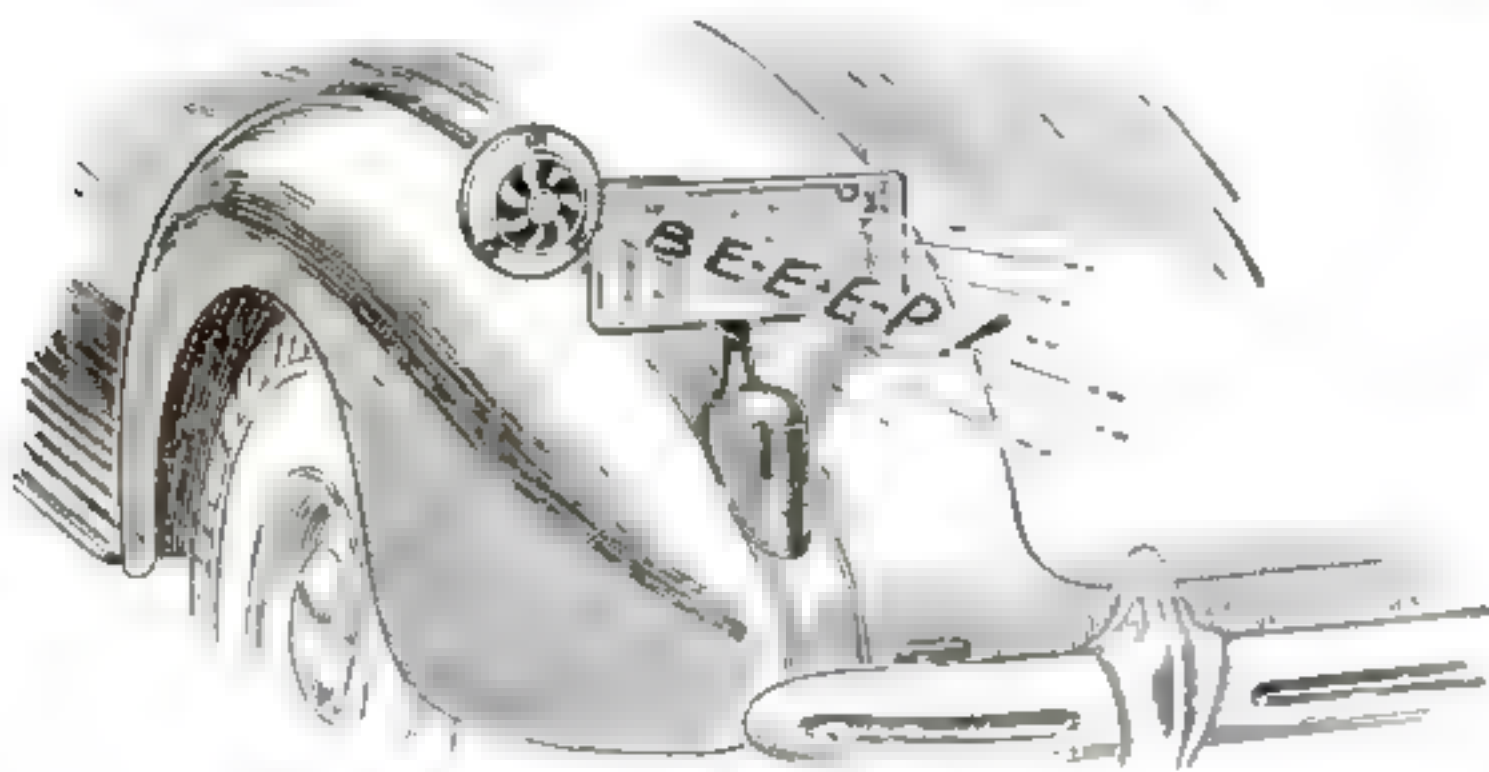
OLD pieces of rubber hose spaced twelve inches apart and placed upright in holes dug into a driveway near the street will discourage motorists from using your drive as a handy place to turn around in. At first glance the hose ends look like a solid barrier, but they bend easily when the owner drives over them, and then spring back into an upright position.—A.H.W.



While this barrier won't hurt a car, it discourages the driveway turners

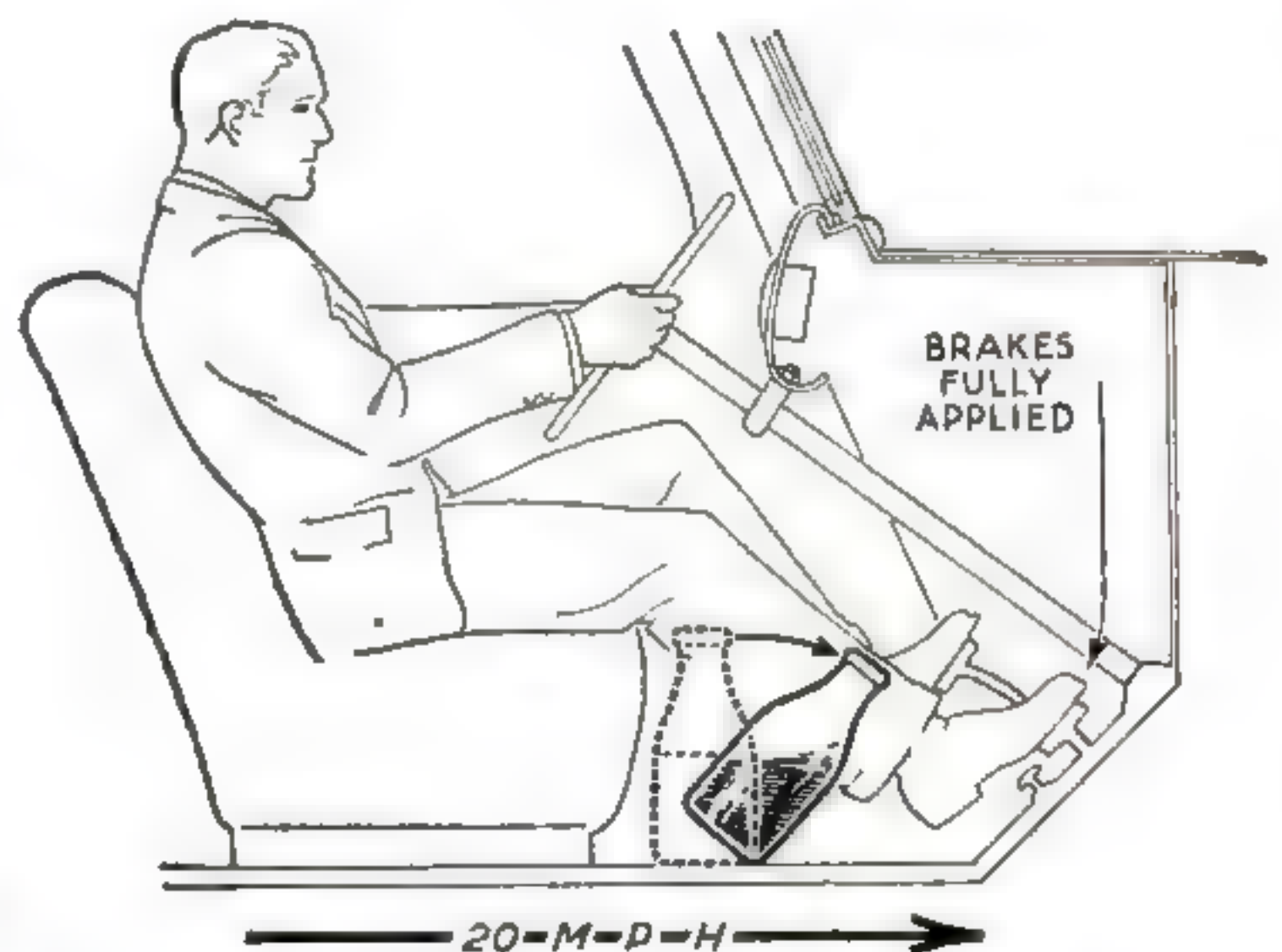
Horn at Rear for Backing

BECAUSE accidents often are caused by motorists backing their cars without warning, I recently put a small horn on the rear of my car. Mounted on the license-plate bracket, the horn is controlled by a button near the driver's seat. The extra horn wire can be tapped into the wire leading from the relay to the regular horn to simplify the job of hooking it up.—C.V.



Door Knob Checks Lights

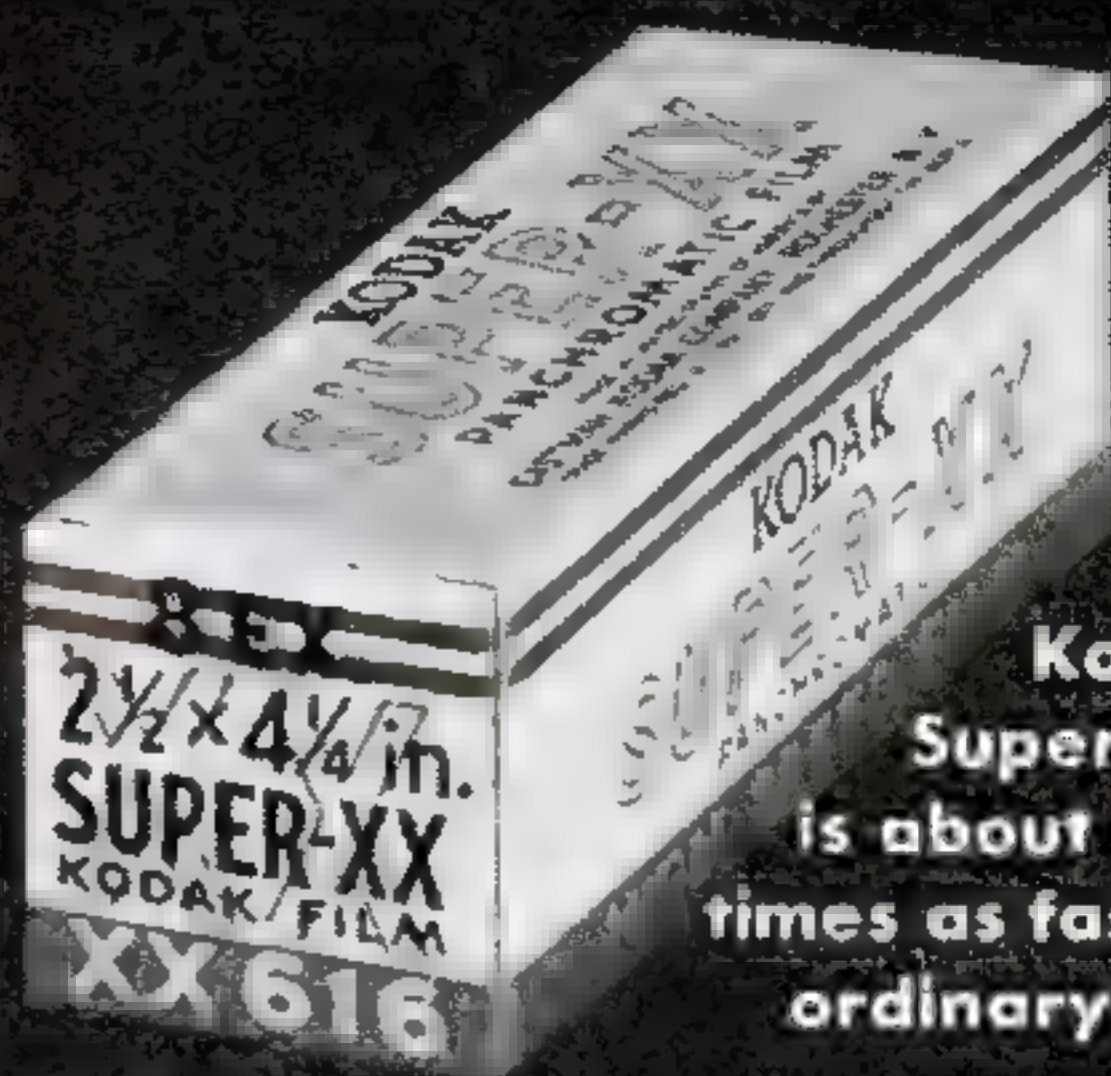
BY mounting a black glazed door knob on the rear wall of a garage, high enough to be seen from the driver's seat, you can provide yourself with a handy headlight tester. The convex reflecting surface will show two bright reflections when both headlights are on and only one when one lamp is out, giving a quick check on both lights.—R.S.



Milk Bottle Tests Brakes

HALF fill a quart milk bottle with water, cap it, and set it on the floor of your car. Drive at twenty miles an hour and jam on your brakes. If the bottle topples over and you stop within thirty feet, the brakes are O.K. If the bottle remains upright, however, the brakes probably need adjusting.—O.S.C.

EASTMAN'S NEW HIGH SPEED FILM



Kodak
Super-XX
is about four
times as fast as
ordinary film

MAKES NIGHT SNAPSHOTS EVERYBODY'S HOBBY



ALL YOU NEED

Your present camera loaded with
the new Kodak Super-XX Film

plus

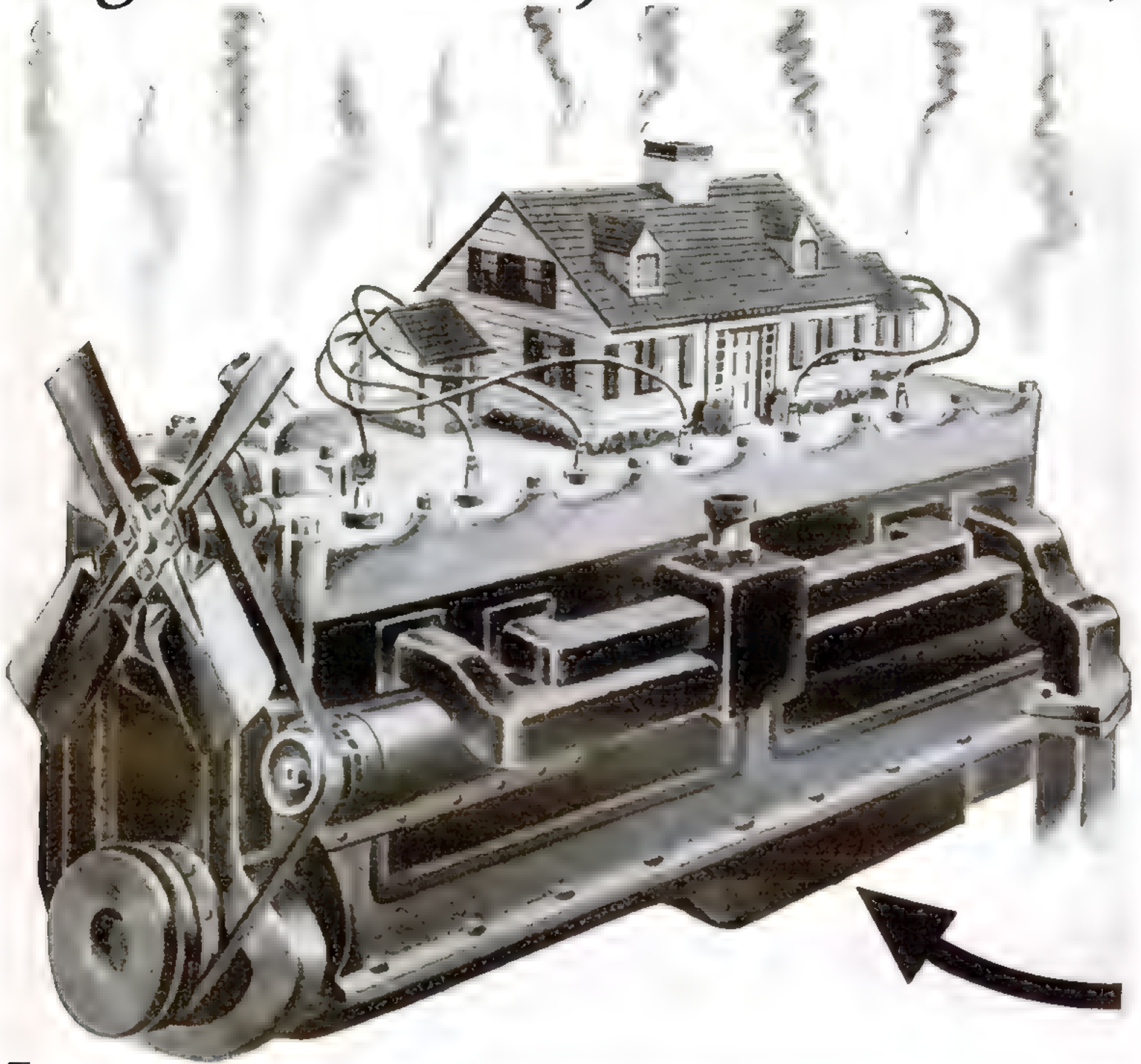
two or three inexpensive
Photoflood lamps in
Kodak Handy Reflectors



NIGHTTIME SNAPSHOTS are sure shots, now. You use any camera that takes the new high speed film, even an inexpensive Brownie—Kodak Super-XX is now available in all standard amateur sizes. You get snaps that have the spontaneous, delightfully lifelike quality of outdoor pictures. And the shooting itself is almost as simple. With Kodak Super-XX, you use two or three inexpensive Photoflood lamps in Kodak Handy Reflectors.

FREE BOOKLET... Condensed course in indoor snapshooting. Detailed, easy-to-understand instructions, interesting photographs, clear-cut diagrams show you how to arrange your lights and place your subjects—how to make your very first batch of indoor snapshots as good as any you'd take outdoors. Get a copy at your dealer's . . . Eastman Kodak Company, Rochester, N. Y.

Engine HEAT, *not winter's cold,*



LABORATORY RESEARCH and experiments show that an automobile engine under full load and at high speed may generate sufficient heat to warm a six room house to 70 degrees on a zero day! That shows you what a big job the cooling system has to do...and why anti-freezes that can't stand heat must be replaced from time to time throughout the winter.

The boiling point of a 50 per cent solution of alcohol and water is only about 180 degrees. This is important

when you consider that modern high-compression motors operate at temperatures up to the 180 mark, *and*

is the real test of an **ANTI-FREEZE**

**THE HEAT FROM
YOUR MOTOR
WOULD WARM
A SIX ROOM HOUSE!**



even above! Further, when you shut off the engine, the heat left in the motor jumps the solution temperature as much as 20 degrees. When an alcohol solution gets hot enough to boil, steam is formed inside the engine and the pressure of this steam forces anti-freeze solution out the radiator overflow pipe onto the ground.

Even if these solution losses are small, they soon add up to a serious total loss of anti-freeze protection with the many stops a car makes in normal driving. Since the driver is rarely conscious of this *hidden boiling* that steals his anti-freeze, a freeze-up in the next cold snap is usually his first warning.

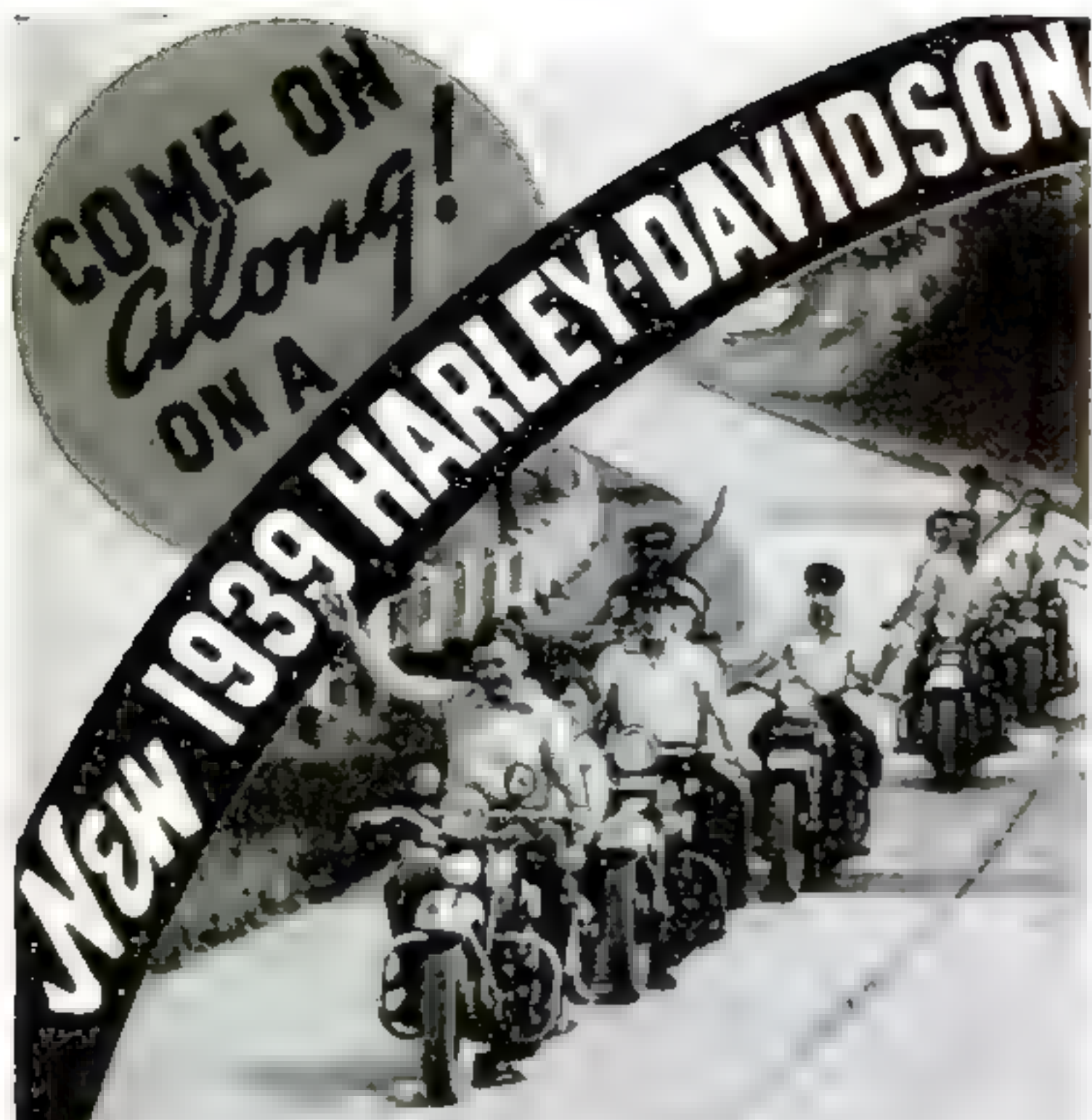
But why consider trouble that *doesn't need to happen?* Put in "Eveready" "Prestone" Anti-freeze today and be done with cooling worries for the whole winter. "Prestone" Anti-freeze contains no alcohol...will not boil off under any winter weather conditions.

The words "Prestone" and "Eveready" are trade-marks of National Carbon Company, Inc.

"EVEREADY" "PRESTONE"

TRADE-MARKS

Anti-freeze is Guaranteed in *Writing*
COSTS MORE BY THE GALLON, LESS BY THE WINTER



Make 1939 Your Biggest Fun Year!

You can pack the whole year with new thrills, pleasures and great adventures—when you own a new 1939 Harley-Davidson. Make more friends — enjoy the country's finest scenery and most popular fun spots with other happy riders. It's a hobby you really can ride — on a mount that's unmatched for zooming power, easy riding and smart styling.

Get into motorcycling — world's greatest outdoor sport—and ride a Harley-Davidson, World's Champion Motorcycle. See the Harley-Davidson dealer — inspect the new 1939 models with their improved performance—still lower upkeep—super-streamlined design — classy appearance and striking color combinations. Ask about his Easy Pay Plans — and mail the coupon NOW!

WINS "JACK PINE" AGAIN! For the 14th consecutive year, Harley-Davidson wins this premier National Endurance Championship!



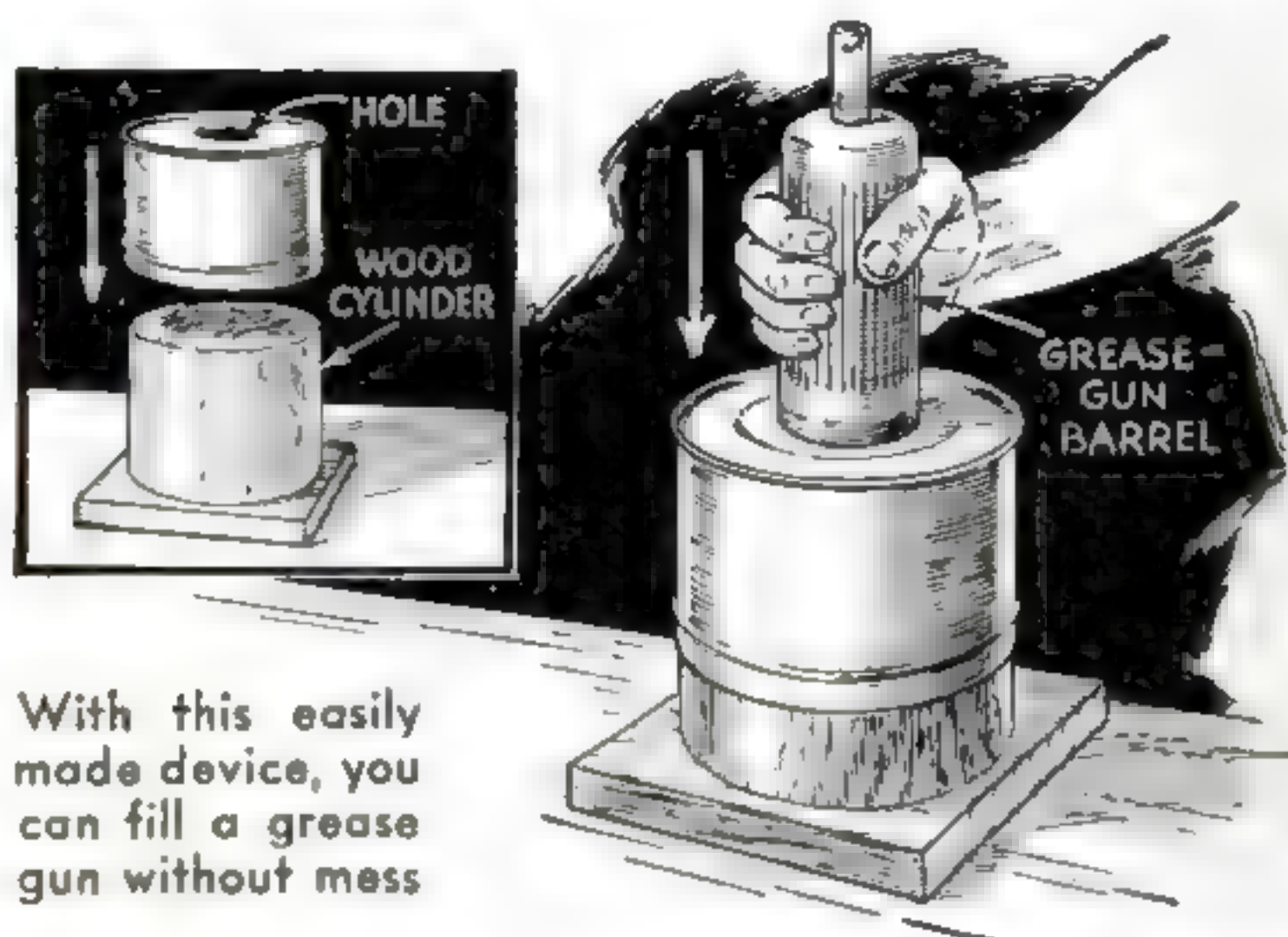
HARLEY-DAVIDSON MOTOR COMPANY
Dept. PS-1238, Milwaukee, Wis.

Send illustrated literature and FREE copy of "ENTHUSIAST,"
Motorcycling Magazine. Stamp is enclosed for mailing cost.

Name _____

Address _____

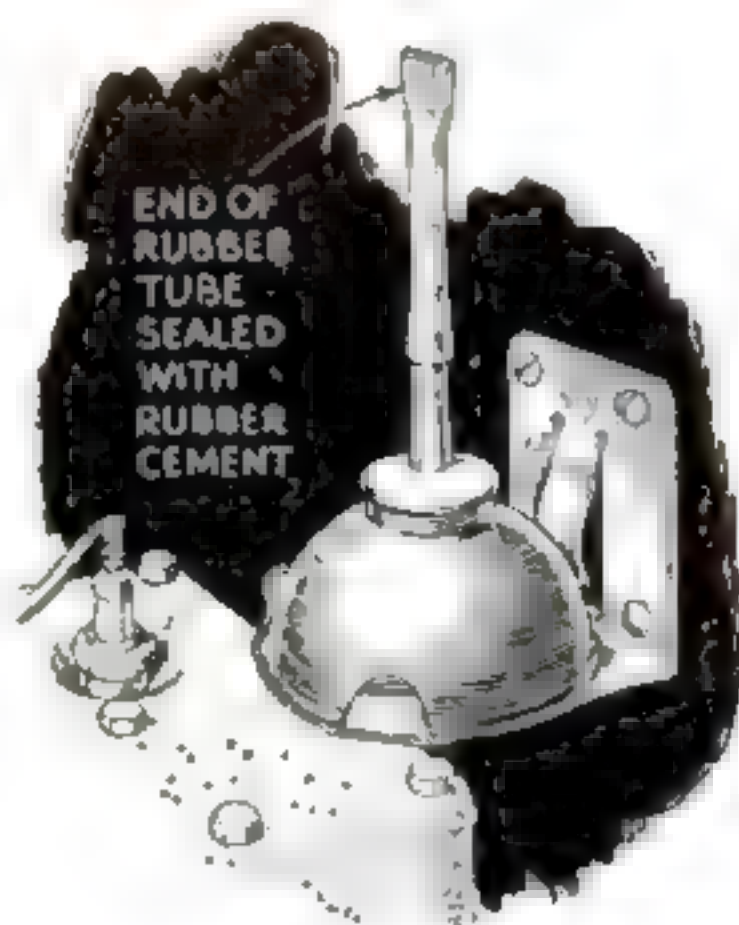
Wooden Plunger Aids In Filling Grease Guns



With this easily made device, you can fill a grease gun without mess

FILLING a grease gun is generally a messy task for the car owner who does his own lubricating work. I solved the problem by the following system: Cut out a cylinder of wood so that it will fit snugly into a can of lubricating grease. Nail it in an upright position to a wooden base. Cut a hole in the bottom of the grease container, making it slightly smaller than the diameter of the grease-gun barrel. Then tip the can of grease upside down on top of the wood cylinder, remove the plunger from the grease gun, place the gun barrel over the opening in the can bottom, and press the gun downward. Grease will be forced out of the can and into the grease-gun barrel easily and with no mess. Between fillings, the can may be left on the wooden cylinder, with some flat, heavy object placed over the hole to keep out dust and dirt.—A.H.W.

Rubber Tube Protects Tip of Oil-Can Spout



DUST and grime can easily sift in and clog the spout of an oil can when it is mounted on a bracket near the engine of an automobile. An easy way to prevent this and also protect the spout tip from injury is to take a short length of rubber tubing and slide it over the oil-can spout, as shown in the accompanying illustration. One end of the tube is sealed with a dab of rubber cement or other adhesive before the tube is slipped over the spout.—R.J.W.

Put this POWER HOUSE *in your car!*



A NEW BATTERY that lasts 68% longer!

● If you drive a '35-'36-'37 or '38 car, you need a more powerful battery than required by earlier models. You need extra power for its high-compression motor—extra power for multiple lights, twin horns, radio, defrosters and the other electrical accessories that add so much pleasure and safety to your driving.

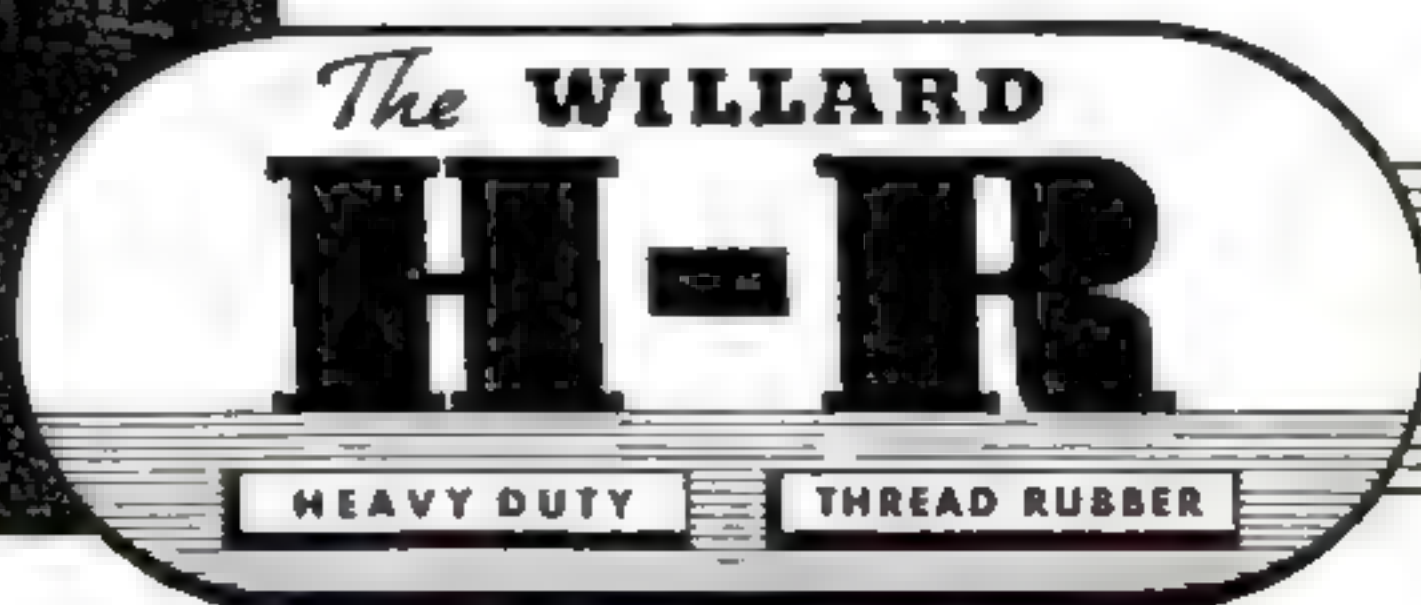
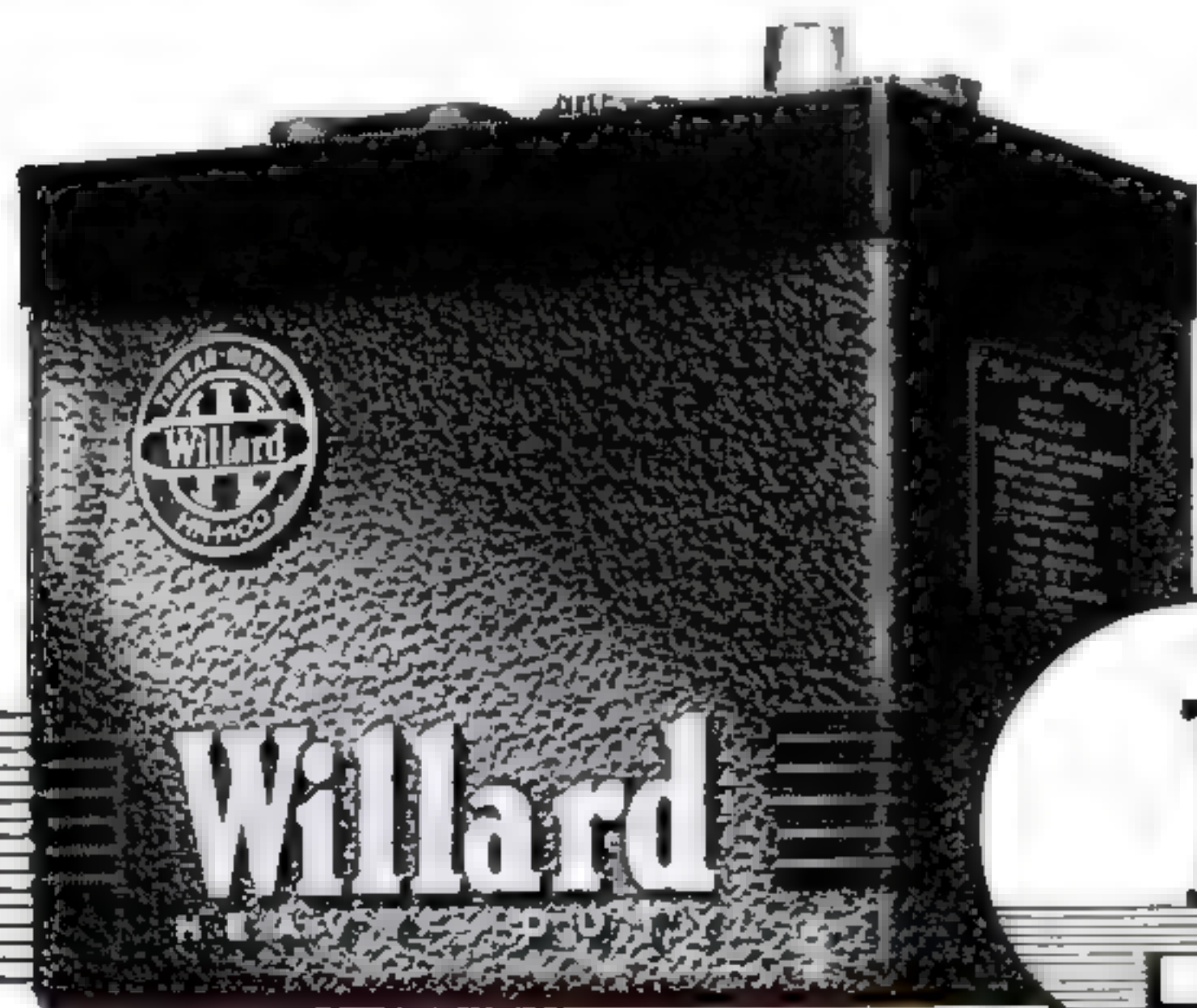
This new Willard "H-R" Battery was built after nine years' study of how people drive and how their batteries perform. It is designed for the present-day car—designed for present-day driving.

It will deliver dependable power to every part of your car just as the substation near you delivers power to every part of your home—when you need it—and where you need it.

THE RECORDS OF 78,000 BATTERIES, DRIVEN OVER ONE BILLION MILES, PROVE THAT THE NEW "H-R" WILL KEEP ON DELIVERING THIS DEPENDABLE POWER 68% LONGER THAN THE AVERAGE OF COMPETING BATTERIES.

Expensive? No,—the "H-R" costs no more to buy than any good battery, and its extra months of life make it cost *less* to own. You'll be safer, and you'll save, if you replace your present battery with a Willard "H-R" now.

WILLARD STORAGE BATTERY CO.
Cleveland • Dallas • Los Angeles • Toronto



• ASK FOR IT BY NAME AT YOUR WILLARD DEALER'S •

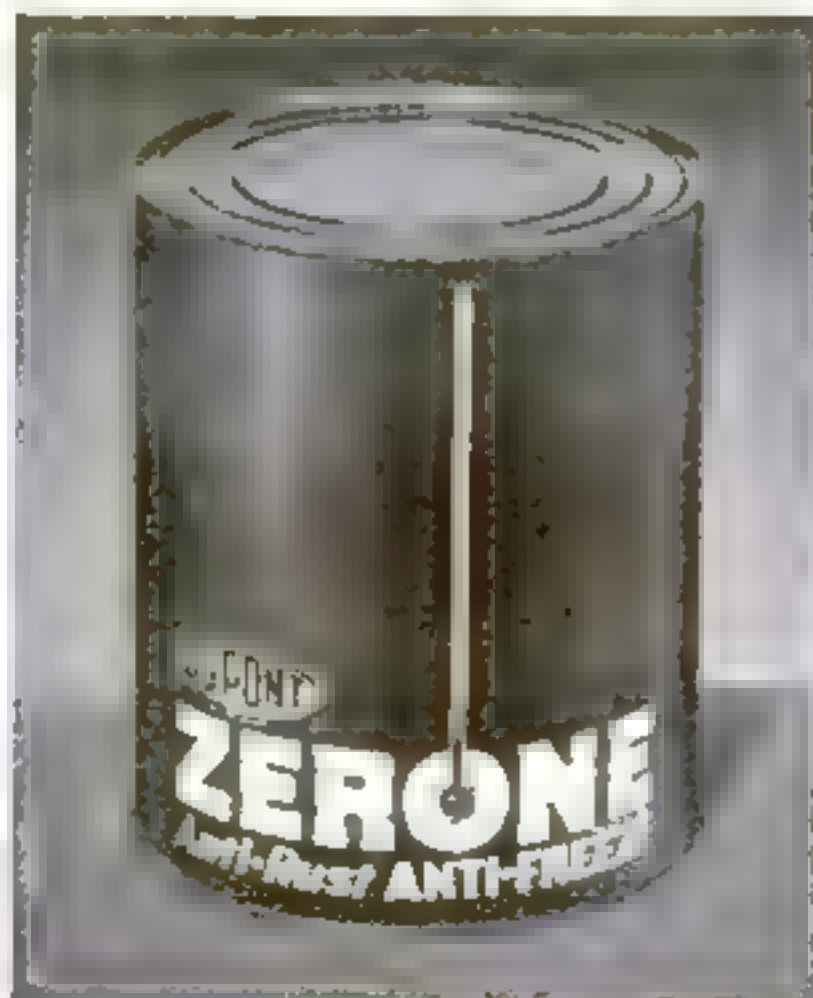
BUY NO ANTI-FREEZE UNTIL YOU READ THESE FACTS ABOUT *Du Pont "Zerone"**

SCIENTIFIC TESTS prove that "Zerone" would keep water from freezing solid even at 215° below zero. You'll never encounter temperatures like that, so you can be sure "Zerone" used in accordance with directions will protect your car in the coldest weather you'll ever experience.

The materials from which "Zerone" is made are so effective you need comparatively little "Zerone" to achieve protection. That's economy. Properly used, replacements of "Zerone" are little indeed—and that's economy, too.

Tests prove that the mixture of "Zerone" and water passes off engine heat better than water alone. That improves engine performance.

"Zerone" in a clean cooling system prevents formation of rust and corrosion—avoids power losses, helps save fuel and oil. Those are the facts, so ask your dealer to protect your radiator with "Zerone" today. It's only \$1.00 a gallon (\$1.20 west of Rockies). Du Pont, "Zerone" Division, Wilmington, Del.



• Reg. U. S. Pat. Off.

Only \$1.00 a gallon
Made by **DU PONT**



Rubber Pads Eliminate Bumper-Guard Scratches

WHEN parking a car close to the stone or concrete end wall of a short garage, chromium-plated bumpers are often scraped and marred by contact with the wall. One way to avoid this is to mount rubber pads on the projecting edges of the bumper guards. At an automobile-supply store obtain several circular rubber pads of the kind designed to be snapped on over brake, clutch, or accelerator pedals. Snap the pads over a disk of metal and fasten the latter to the bumper by means of a strap of chromium-plated iron bent around the edges of the bumper guard, as pictured above. Such pads are not unsightly, and are easily replaced if torn off. Sometimes a rubber vacuum cup, attached to the bumper with the aid of a little glycerin or castor oil, will do the trick.—W.E.B.

Auto Mechanics... Money for Your Ideas

IF YOU work in a garage, you have undoubtedly devised novel short cuts and timesavers that would be of interest to car owners. These hints are worth money to you. **POPULAR SCIENCE MONTHLY** pays well for short articles, illustrated with sketches or photographs, describing new kinks for motorists. Write a hundred words or so about your pet idea and send it to the Automobile Editor, **Popular Science Monthly**, 353 Fourth Avenue, New York, N. Y. If it is acceptable, a check will be mailed immediately.

...she couldn't
say No to that
VELVET
aroma

Velvet

- the **MILDNESS**
of fine old
Kentucky Burley
aged in wood
- the **FLAVOR**
of pure maple
sugar for extra
good taste

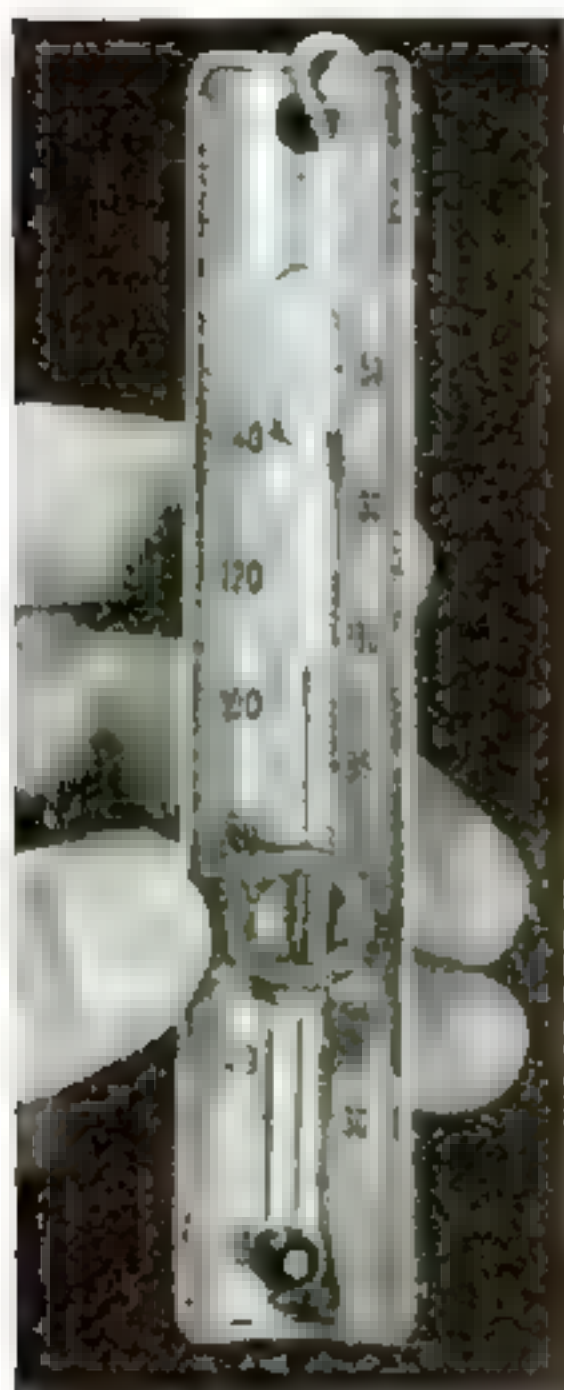
*Velvet packs easy in a pipe
Rolls smooth in a cigarette
Better tobacco
for both*

*Better smoking
tobacco*

Copyright 1938, LIGGETT & MYERS TOBACCO CO.

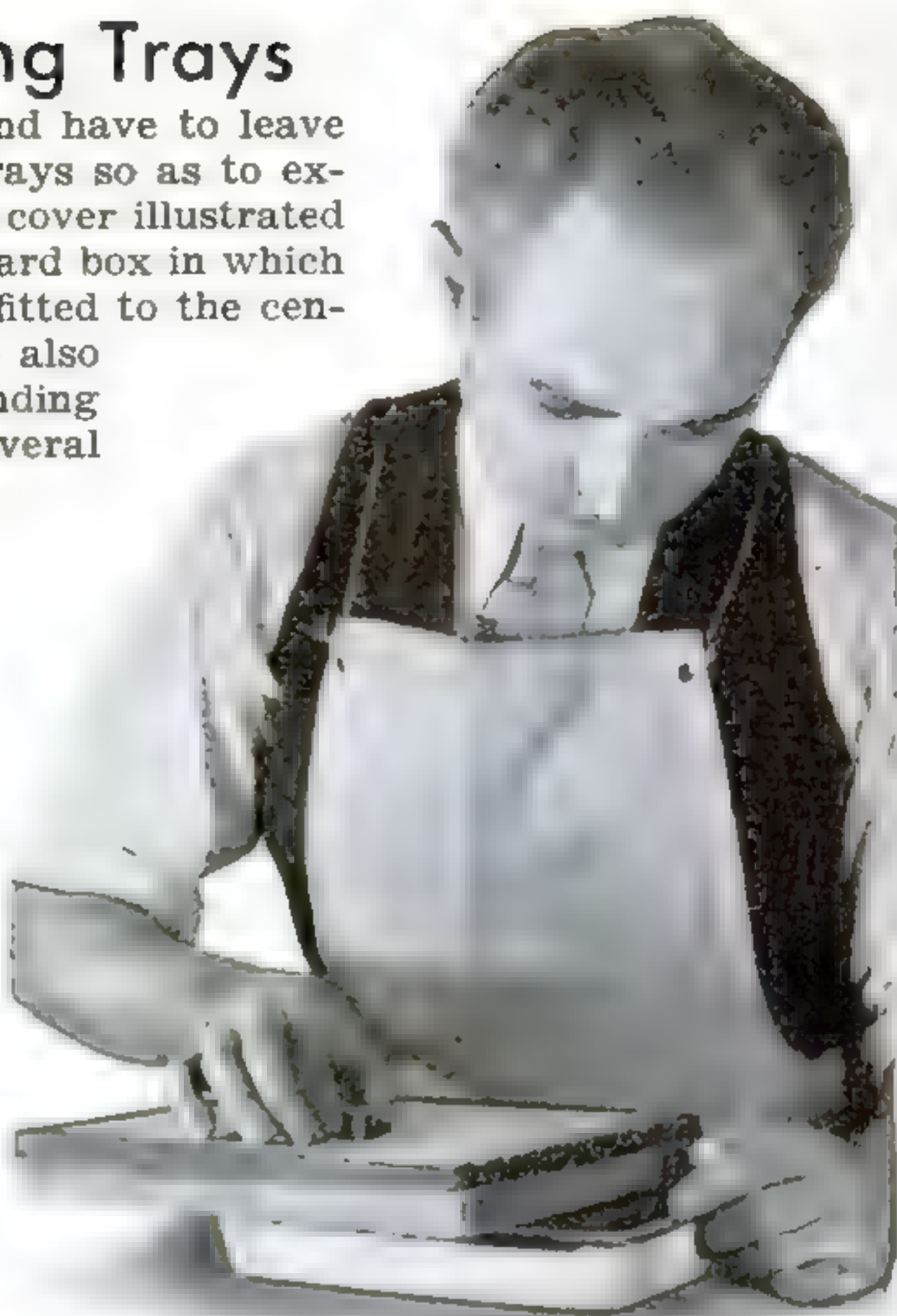
Covers for Photo Developing Trays

WHEN you develop films by the tray method and have to leave the darkroom at intervals, it pays to cover the trays so as to exclude whatever light enters through the door. The cover illustrated at the right is merely a black-lined lid of a cardboard box in which enlarging paper was purchased. A small knob is fitted to the center to facilitate handling. Covers of this type are also useful to keep dust from solutions that are left standing for some time in the trays so it is wise to have several on hand.—K. M.



Small Lens Added to Thermometer

AS AN aid in seeing the 65-deg. mark of a thermometer used for photographic developing, fasten a small lens over it as shown. Lenses of the type to be found in the view finders of a discarded box camera are often mounted in a wood frame, and may be attached with a drop of cellulose cement. If a plain lens is used, attach with waterproofed cardboard or wire.



When a developing tray has to be left standing, a cardboard cover will protect it from light and dust

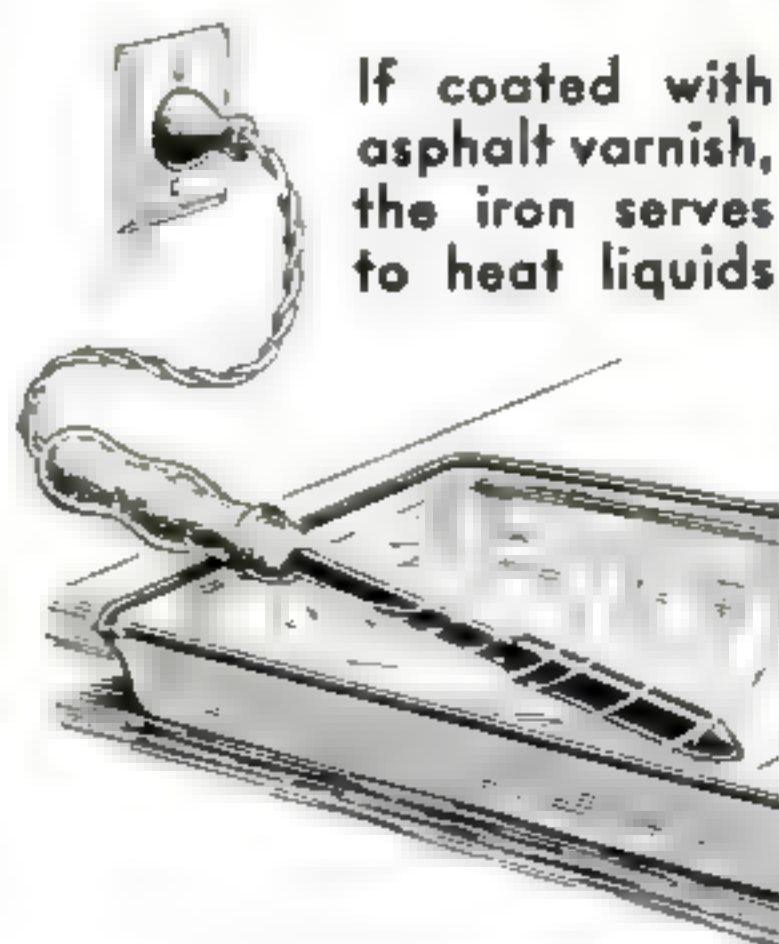


Stove-Polishing Liquid Refinishes a Camera

LEATHER dyes are available for touching up the leather covering of a camera when it becomes scuffed or worn looking, and there is even a kit on the market that contains three types of lacquers—dull, semigloss, and gloss—for photographic use. However, a coating of ordinary liquid stove polish also will do wonders in renewing the appearance of a camera. Use a small brush or piece of sponge, and after the polish has dried thoroughly, rub it briskly with a cloth. Black-enameled metal parts can be restored the same way.

Low-Power Soldering Iron Warms up Developers

DEVELOPING solutions can be warmed by means of a small soldering iron of the type sometimes sold for as little as twenty-five cents. Coat it thoroughly with thick asphalt varnish, then turn on the current until the varnish is well baked. In use, immerse the heater in the tray or tank before turning on the current so the protective varnish will not crack with the sudden temperature change.



If coated with asphalt varnish, the iron serves to heat liquids



\$7.50 EACH POSTPAID

Most Unusual MOVIE OFFER EVER MADE

GET BOTH CAMERA & PROJECTOR for Only \$13.50 Complete and Postpaid

\$7 EACH POSTPAID



Everything to take and show **real 16 mm. movies** at less cost than taking snapshots.

CAMERA — Spring Motor drive — Automatic Release Button — Footage Indicator — 50 foot capacity. No adjustments necessary.

PROJECTOR — Quiet, smooth and flickerless — Motor driven — sturdily built. Uses any standard 16 mm. film.

Write NOW for Big **FREE** Catalogue of Movie Supplies and Film Subjects. We are never undersold.

PARAMOUNT MFG. CO., DEPT. M-11 BOX 224, BACK BAY, BOSTON, MASS.

FREE 50 FOOT PROJECTOR FILM with each \$13.50 COMBINATION.

Now! MOUNT SNAPSHOTS With One Single PHOTOMARK

Introductory Offer!

NEW, SMART, ALBUM . . . \$2.50
50 PHOTOMARKS40
\$2.90 Value, Now Only \$1.95

24 sheet, loose-leaf Album, 9"x12". Colorful, modern fabric cover. Transparent sheets between pages.



STUTZ PHOTO SERVICE
10856 Shoemaker Ave., Dept. PS-12
DETROIT, MICHIGAN

FREE postage if money accompanies order. 3 days inspection. Money-back guarantee.

YOUR OWN MOVIES! 10¢ A DAY!

NATIONALLY ADVERTISED 8MM and 16MM Movie cameras, projectors. For home, business, church, school, club. **MONEY BACK 10 DAY TRIAL.** Pays into as low as 10¢ A DAY. Satisfied customers throughout the world. **FREE** details. **WRITE TODAY.**

Don Elder's Home Movies, Dept. C-12, 739 Boylston, St., Boston, Mass.

FREE 64 PAGE Xmas Catalog

GIFT VALUE Like this PHOTO ENLARGER



Complete with "Loack Definin" f.4.5 anastigmat lens, Ruby lens filter; condenser system; unique clamping device permits adjustable framing. Linear magnification - 2 to 10 diameters. Masking device for up to 1 1/2 x 1 1/2" negatives. Size of board 15 1/2" x 11 3/4".

\$23.95

SPECIAL Only.

GIVE finer gifts — and save money this Christmas! Send for our 64 page Gift Catalog jammed with a **COMPLETE** line of Cameras and Photo Supplies, Lafayette radios, electric shavers, clocks, trains . . . a whole toyland of children's gifts — at prices that put money back into your pocket. Mail coupon now!



WHOLESALE RADIO SERVICE CO. INC.

NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.
100 SIXTH AVENUE • 901 W. JACKSON BLVD. • 265 PEACHTREE STREET
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.

WHOLESALE RADIO SERVICE CO., INC.
100 SIXTH AVENUE, NEW YORK, N.Y.
Rush **FREE** 64 Page Gift Catalog No. 75-9M8

Name.....
Address.....
City..... State.....

LET "VALU-BILL" BE YOUR SANTA

PASTE COUPON ON PENNY POSTCARD



"G-E flash bulbs assure highest quality for fast action photography" . . .

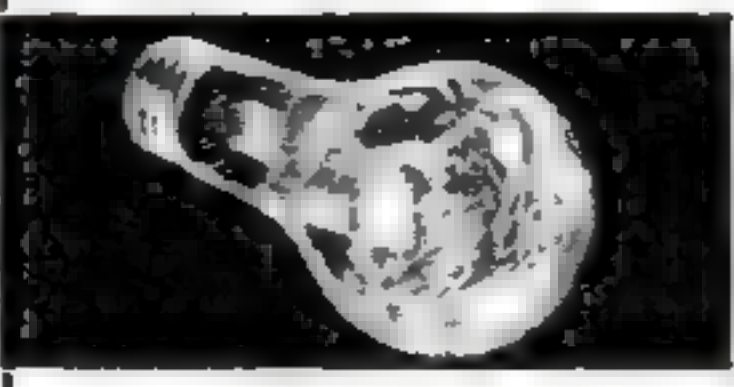
says
GEORGE KARGER,
Staff Photographer,
Pix Publishing, Inc.



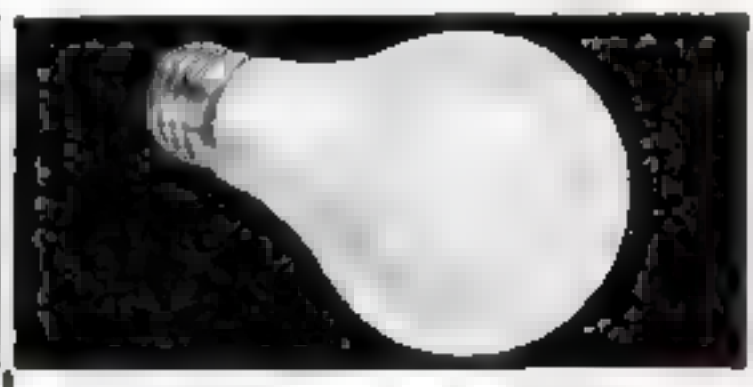
Action shot by Karger, of Polly Iuen Radio City Music Hall Corps de Ballet

Here's why they'll help YOU get clearer shots

- 1. EASY TO USE . . .** Flash! and you've got the picture . . . just like a news expert . . . even if you have only a simple, inexpensive camera.
 - 2. PLENTY OF LIGHT** for clearer pictures. G-E MAZDA Photoflash lamps are like a package of sunlight for your camera. For that once-in-a-lifetime shot, here's the lamp to use! Grand for color, too. Each lamp gets one good picture. Buy G-E Photoflash lamps where you buy film.
- SYNCHRONIZED SHOTS?** Try G-E's new No. 7 lamp.



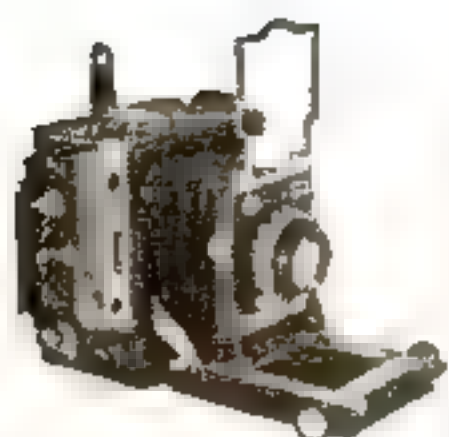
G-E MAZDA PHOTOFLASH LAMPS
No. 10 . . . 15¢ list
Get them at your camera shop or drug store



for dozens of shots . . .
G-E MAZDA PHOTOFLOOD LAMPS
No. 1 . . . 25¢ list
No. 2 . . . 50¢ list

GENERAL ELECTRIC MAZDA PHOTO LAMPS

Please mention POPULAR SCIENCE when writing to advertisers.



SPEED GRAPHIC—Focal Plane Shutter. Four sizes: new Miniature 2½x8¼ and 3½x4¼, 4x6 and 5x7.



NATIONAL GRAFLEX—Finest of all miniature reflex cameras. F.3.5 lens; focal plane shutter speeds to 1,500.



GRAFLEX ENLARG-OR-PRINTER—Enlarger, contact printer and retouching desk—almost a complete darkroom in itself.



A Graflex-made Picture by Harold M. Lambert

GIVE GRAFLEX

Choose Graflex American-made, Prize-Winning photographic equipment and, whether you give or receive this December 25, it's sure to be a Merry Christmas. See these and other Graflex-made products at your Dealer's. He'll gladly help you with your selection.

"Photographic Enlarging"

This popular book by Franklin I. Jordan, F.R.P.S., makes a splendid, inexpensive gift. Now only \$2.50.

FREE! Send for free catalog and free Gift Guide. Paste coupon—or write your request on penny post card, if you wish. Folmer Graflex Corp., Dept. PS-20, Rochester, N.Y.



FOLMER GRAFLEX CORPORATION
DEPT. PS-20, ROCHESTER, N. Y., U.S.A.

Please send me your free Graflex catalog and free Graflex Annual Gift Guide.

NAME _____

ADDRESS _____

CITY _____ STATE _____

GRAFLEX Prize-Winning CAMERAS

8
good
pictures
out of
8



COLOR or black and white—it's a thrill to get all your negatives *correctly exposed* so that prints or transparencies come back clear and sparkling. And it's not difficult.

The General Electric exposure meter will give you the correct camera setting for all your pictures—for any type of film or camera. Now, there's no reason to waste film or lose the record of your favorite scenes. The G-E meter will get each picture for you—quickly, easily.

See your photo dealer. He will be glad to show you the G-E meter and explain why its sensitivity, directional effect, and accuracy enable you to take better pictures. General Electric, Schenectady, N. Y.

GENERAL  ELECTRIC

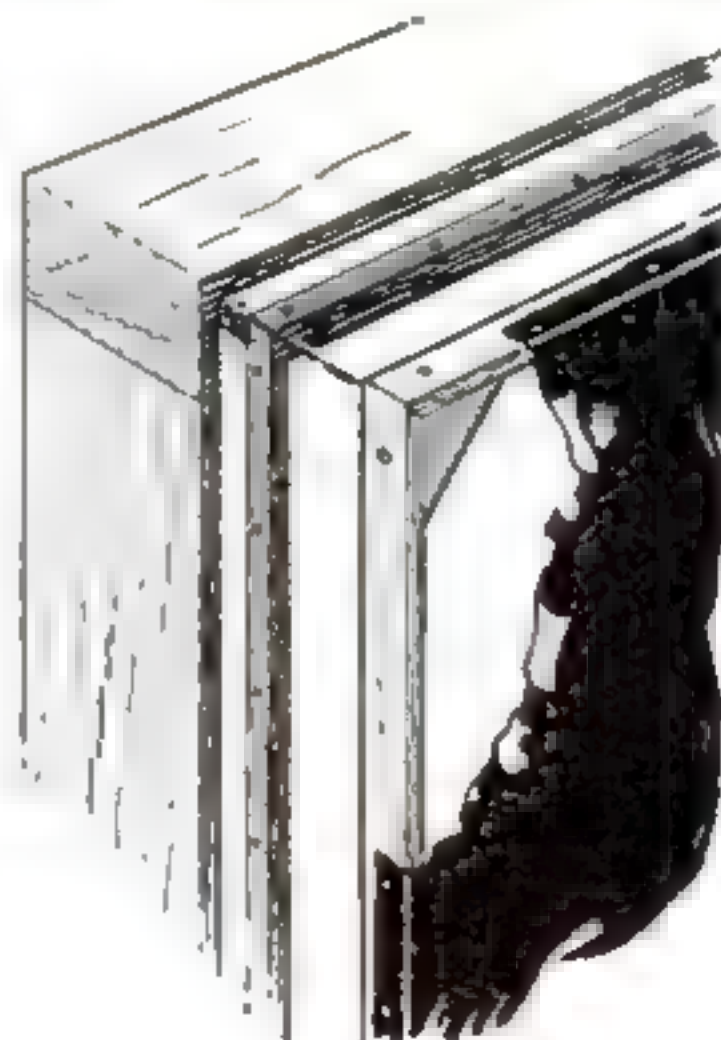
470-115P1



Converting a Basement into a Darkroom

THERE is perhaps no easier way for the amateur photographer to obtain a darkroom than by making the entire basement light-tight. This method costs little and has the great advantage of giving plenty of elbow room—something that most improvised darkrooms lack.

For each window and the door, if it has lights of glass, make a frame of laths or other thin material and fasten it to the window frame or door. Then make other frames just large enough to fit over them without binding. Cover these frames with black building



paper or other opaque material by bending the material over the edges and securing with tacks. These frames are then superimposed over the first to form effective light traps. When not in use, the frames may be hung on a horizontal block nailed to the sill, adjacent to each window.—C. A. VEBURG.

Please mention POPULAR SCIENCE when writing to advertisers.

WRITE TO *Bass* **FOR HIS BOOK OF BARGAINS**

ORDER FROM THIS LIST OF BASS GUARANTEED BARGAINS

- ELWOOD ENLARGER—takes negatives 2 1/4 x 3 1/4 or smaller.....\$22.50
- SUPER SPORT DOLLY—built-in range finder, 16 or 12 shots on 120 film, Xenon f.2.8 lens, Compur B List \$65\$52.50
- 4 x 5 CROWN VIEW CAMERA—19" bellows—Graphic type back, no lens, new...\$57.50
- CANDID MIDGET—F:4.5 Wirgin lens, Vario shutter\$19.50

Write Dept. PS
BASS CAMERA COMPANY
 179 W. Madison St. Chicago, Ill.

PHOTO ENLARGEMENTS **5¢** **ANY SIZE**

Is Photography your hobby? Do you want a profitable easy business at home? Make **PHOTO ENLARGEMENTS** for yourself and others. Your cost 5c each and less. The Ideal Photo Enlarger is **AUTOMATIC**. No experience required. Also **COPIES** any picture \$5.94 **COMPLETE**. Interesting circular **FREE**.

IDEAL-X, 122 East 25th Street, NEW YORK

CAMERAS-ACCESSORIES **NEW & USED at BARGAIN PRICES** **TRADE-IN YOUR OLD CAMERA**

SENSATIONAL XMAS VALUES!

- 6 x 9 B&H, Film Pack & Plate, D'b'le Ext. Bellows, F4.5 Anastigmat lens, S. T. compur, New... **\$27.50**
- 85 mm MIDGET MARVEL F2.9 anast., Eveready **\$30.00**
- Case New PRECISA, Rol film, 12 exp. 2 1/4 x 2 1/4; 16 exp. 2 1/4 x 1 3/8, F2.9 anast. lens, S. T. compur, New... **\$27.50**

We buy—Sell—Exchange—Write today
 109 Fulton St. **NEW YORK CAMERA EXCHANGE** New York
 Dept. P. S.-12
 CAMERA EXCHANGE ORIGINATORS SINCE 1890

DO YOU **WANT** a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address **Stephenson Laboratory, 62 Back Bay, Boston, Mass.**

U. S. REVENUE CUTTER "JOE LANE"

Complete with precision shaped and hollowed hull, accurate full size plans, assembly instructions, all deck and spar material, all **FINISHED FITTINGS**, and complete history of the "JOE LANE"—\$7.00.

Send 15c in coins or stamps for complete 8 1/2 x 11 catalogue with full page illustrations of the latest innovations in marine models.

MARINE MODEL COMPANY
 174 Worth St. Dept. 212 New York, N. Y.

WORLD'S GREATEST all around ELECTRIC TOOL

DRILLS—GRINDS—SANDS—SAWS
POLISHES—SHARPENS—CARVES

The new **WHIZ ELECTRIC TOOL** is the handiest power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/4 inch iron plate in 42 seconds or engraves intricate designs on jewelry. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates labor. Plug into any socket AC or DC, 110 volts. Chuck 1/4 inch capacity. Ball bearing thrust. Powerful, triple-gear motor. "Worth its weight in Gold." **STANDARD MODEL** with Normal Speed (uses 60 different accessories, instantly interchangeable). Special Introductory Price for limited time, only \$8.95.

FREE Accessory outfit (Value \$2) includes set of drills, mounted 1 1/4 inch grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, carving bur, etc. **FREE** with each outfit ordered NOW. We pay postage. Will send C. O. D. if desired. **10-DAY TRIAL—MONEY BACK GUARANTEE.**

Special "2-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only \$8.95 complete, with same accessory outfit (value \$2) **FREE**.

Paramount Products Co., Dept. 12C, 48 West 48th St., New York

FIRST ON ANY XMAS LIST

...FOR CAMERA OWNERS

WESTON Junior Exposure Meter

Look "high and low," there's nothing you can give the camera owner that will be so completely satisfying . . . more gratefully received . . . than a WESTON Exposure Meter. It's the one gift he will take genuine pride in owning, because it will assure perfect pictures throughout the years, and especially because it bears the name WESTON. See WESTON Exposure Meters at your dealer's today, or return coupon for literature.

Look "high and low," there's nothing you can give the camera owner that will be so completely satisfying . . . more gratefully received . . . than a WESTON Exposure Meter. It's the one gift he will take genuine pride in owning, because it will assure perfect pictures throughout the years, and especially because it bears the name WESTON. See WESTON Exposure Meters at your dealer's today, or return coupon for literature.

Weston Electrical Instrument Corporation
 622 Frelinghuysen Avenue, Newark, N. J.
 Please send literature on WESTON Exposure Meters.

Name.....
 Address.....
 City..... State.....

Fotoshop CARNIVAL of CAMERAS!

Our Fall "CARNIVAL OF CAMERAS" offers you outstanding values in cameras, equipment, lenses and supplies. Prices are non-competitive. Liberal trade-in allowance. Money back guarantee.

Send for new "CARNIVAL OF CAMERAS" catalog.....Now ready!

18 E. 42nd St. Dept. G-4 **136 W. 32nd St. New York, N. Y.**

FREE CAMERA BOOK!

Offers hundreds of money-saving bargains in Still and Movie Cameras, Lenses, Films, Enlargers, Exposure Meters, Dark-room Supplies—everything photographic.

Choose from America's most complete, varied stock—from world's leading makers: Eastman, Zeiss, Bell & Howell, Graflex, Korona, Bausch & Lomb, etc. 10 Days Trial—Satisfaction Guaranteed. (Your camera, equipment taken in trade.) Write for Free Camera Catalog NOW!

CENTRAL Camera Co. (EST. 1899)
 230 S. Wabash, Dept. S-12, CHICAGO

Please mention POPULAR SCIENCE when writing to advertisers.

"MAKE IT A MERRIER MASONITE CHRISTMAS FOR MOTHER AND DAD!"



FOR MOTHER: A beautiful sewing box with ample room for needles, spools and all the little gadgets Mother likes to have handy when she's sewing. Divided into two compartments with hinged lids. A graceful handle makes it easy to carry. Build it with MASONITE TEMPERED PRESWOOD and you'll be proud of its smooth, lasting finish. And you'll be amazed at how easily it can be cut out and put together.

FOR DAD: The handiest tool kit he's ever seen. Light in weight . . . easy to carry . . . sturdy MASONITE TEMPERED PRESWOOD sides and bottom that can take all the knocks.

Of course, you want to build these and many other handsome Christmas gifts with Genuine MASONITE. Mail the coupon today for free plans and specifications of Mother's sewing box and Dad's tool kit.



MASONITE

THE WONDER WOOD OF A THOUSAND USES

A MISSISSIPPI PRODUCT

SOLD BY LUMBER DEALERS
EVERYWHERE

MASONITE CORPORATION, Dept. PS-12
111 W. Washington St., Chicago, Ill.

Please send me—absolutely FREE—plans and specifications for the smart sewing box and handy tool kit I'm going to build for Christmas presents.

Name _____

Address _____

City _____ State _____



Early Colonial pine chest, plan 308A, 25c

250 Suggestions for Gifts You Can Make

GIFTS that you make in your home workshop are prized a great deal more than those bought at a store. Whether you want to construct furniture, radio sets, models, toys, or novelties, our blueprints will help you. More than 250 plans are available, some of which are given below. A complete list will be sent upon receipt of a stamped and self-addressed envelope.

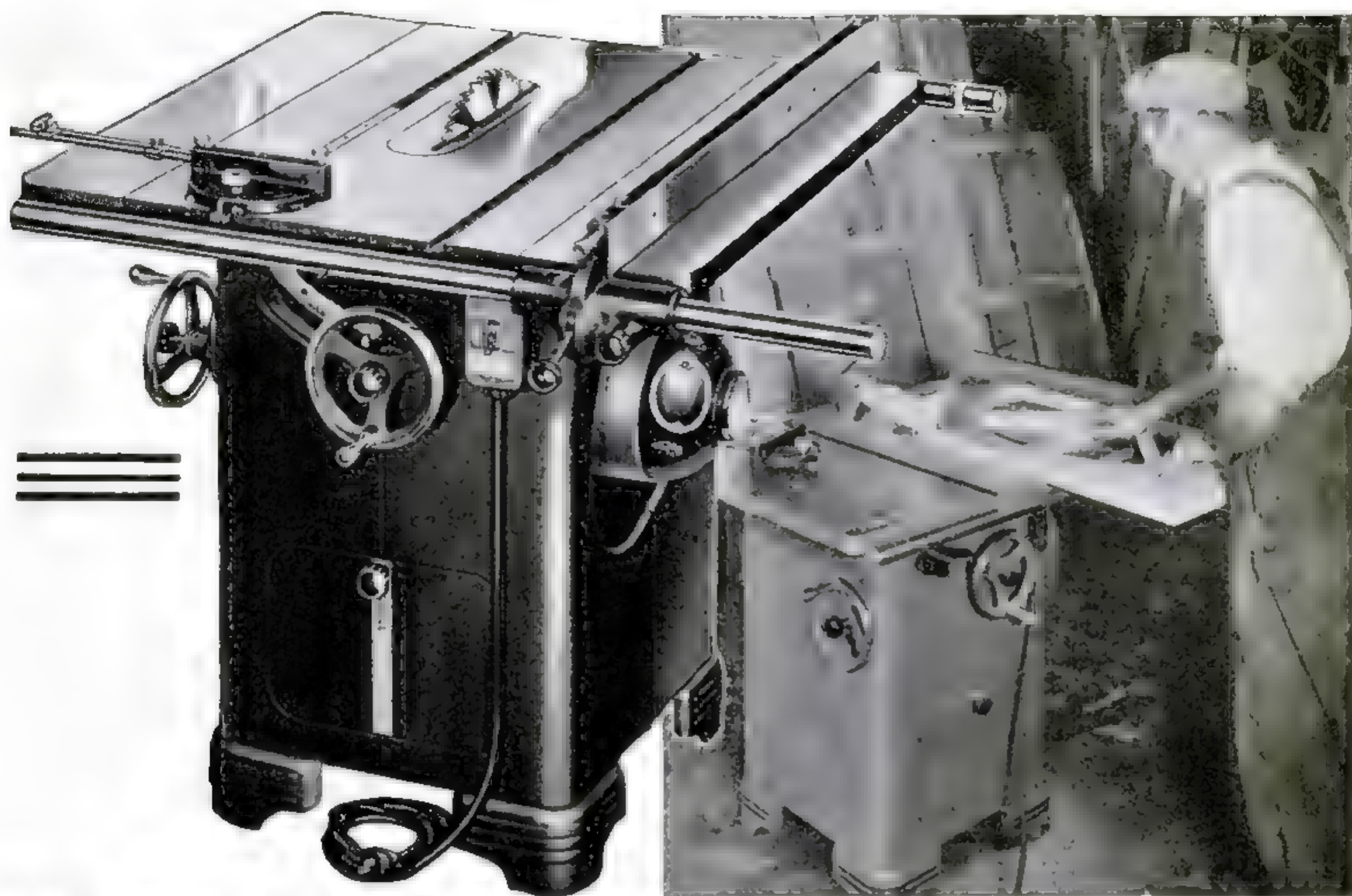
FURNITURE

Coffee Table, spiral legs, 245A.....	\$0.25
Double-Decker Bed, 277A.....	.25
Early American Round-Top Stand, 191A.....	.50
Fireside Bench, Colonial, 187A-188A.....	.50
Flat Top Desk, 2' 2" by 4' 2" top (no turning), 20....	.25
Floor Lamp, with tripod base, 243A.....	.25
Four-Leaf Card or Occasional Table, 239A.....	.25
Hanging Wall Cabinet, 9 1/2" by 24" by 41 3/4", 280A....	.25
Magazine Rack, ladder-back style, 250A.....	.25
Modernistic Folding Screens, four designs (no turning), 91 .....	.25
Queen Anne Dressing Table, Stool, and Mirror, 295A .....	.75
Sewing Table, 16" by 20" top with drop leaves (no turning), 1 .....	.25
Silverware Chest on Stand, 256A .....	.25
Small Early Colonial Pine Chest, 32" long, 21" deep, 24" high, 308A.....	.25
Smoking Stand, modern, 238A.....	.25
Tea Wagon, with removable tray and drop leaves, 20" by 30" top (turning), 13.....	.25
Treasure Chests, with metal bindings (no turning), 78 .....	.25
Upholstered Stool, 240A.....	.25

MODELS

Aircraft Carrier SARATOGA (18") and a Flush-Deck Destroyer (6 1/4"), 226-227-R.....	.75
Barnegat Lighthouse, 10 1/2" high, 298A.....	.25
BLUENOSE, famous fishing schooner, 17 1/2" hull, 110-111-112-R	1.00
Civil War Ships MONITOR, MERRIMAC, and HARTFORD, water-line models 3 1/2", 5 3/8", and 5 1/2" long respectively, 258.....	.25
Clipper Ship GREAT REPUBLIC, 31 1/2" hull, 272-273-274-R	1.25
Clipper Ship SEA WITCH, 9 1/2" hull, 219.....	.25
Coast Guard Patrol of 165-ft. Type, 20 3/8" hull, 286-287-R .....	.75
Concord Stagecoach DIAMOND TALLY-HO, 20 1/2" long, 115-116-117-R	1.00
Confederate Raider ALABAMA, 21 1/2" hull, 335-336-337-R	1.50

(Continued on page 238)



REMARKABLE NEW TOOL

-A Perfected Tilting-Arbor Saw!

Tilting Arbor Saws are not new—but a Tilting Arbor Saw with *all* the flaws of existing designs *completely eliminated* is decidedly new! Perfected after seven years of patient testing and experimenting—the new Delta Tilting Arbor Saw is the ideal circular saw for small shops, home workshops, schools, contractors, shipping and maintenance departments, woodworking plants—in fact wherever a compact low-priced, *efficient* circular saw is needed. Some of its outstanding points are: Powerful fully enclosed motor; highly efficient “Tex-Rope” drive; perfected raising, lowering and tilting mechanism; new scientifically designed rigid housing; patented double-face, double-lock rip gauge; exclusive precision auto-set miter gauge; pat-

ented ripping extensions; sealed-for-life ball bearings; forged alloy-steel arbor; extra large table; “Point-of-use” controls and numerous other features.

Send for FREE CATALOG

There are so many important new features, so many basic improvements in this new Delta Tilting Arbor Saw that it has been necessary to prepare a complete section in the Delta Catalog to tell the story adequately. Liberally illustrated, this section is a dramatic story of modern engineering progress—and at the same time the complete inside story of the tilting arbor saw.

Send for your copy of the new 1939 Delta Catalog illustrating, describing, and listing prices of the complete 1939 line of Delta “Quality” motor-driven tools. Send the coupon TODAY!

DELTA MANUFACTURING CO.
600-634 E. Vienna Ave.
MILWAUKEE, WIS.

DELTA MFG. COMPANY, Dept. B1238
600-634 E. Vienna Ave., Milwaukee, Wisconsin.
Gentlemen: Please send me 1939 Delta Catalog and full details on the New Delta Tilting Arbor Saw.

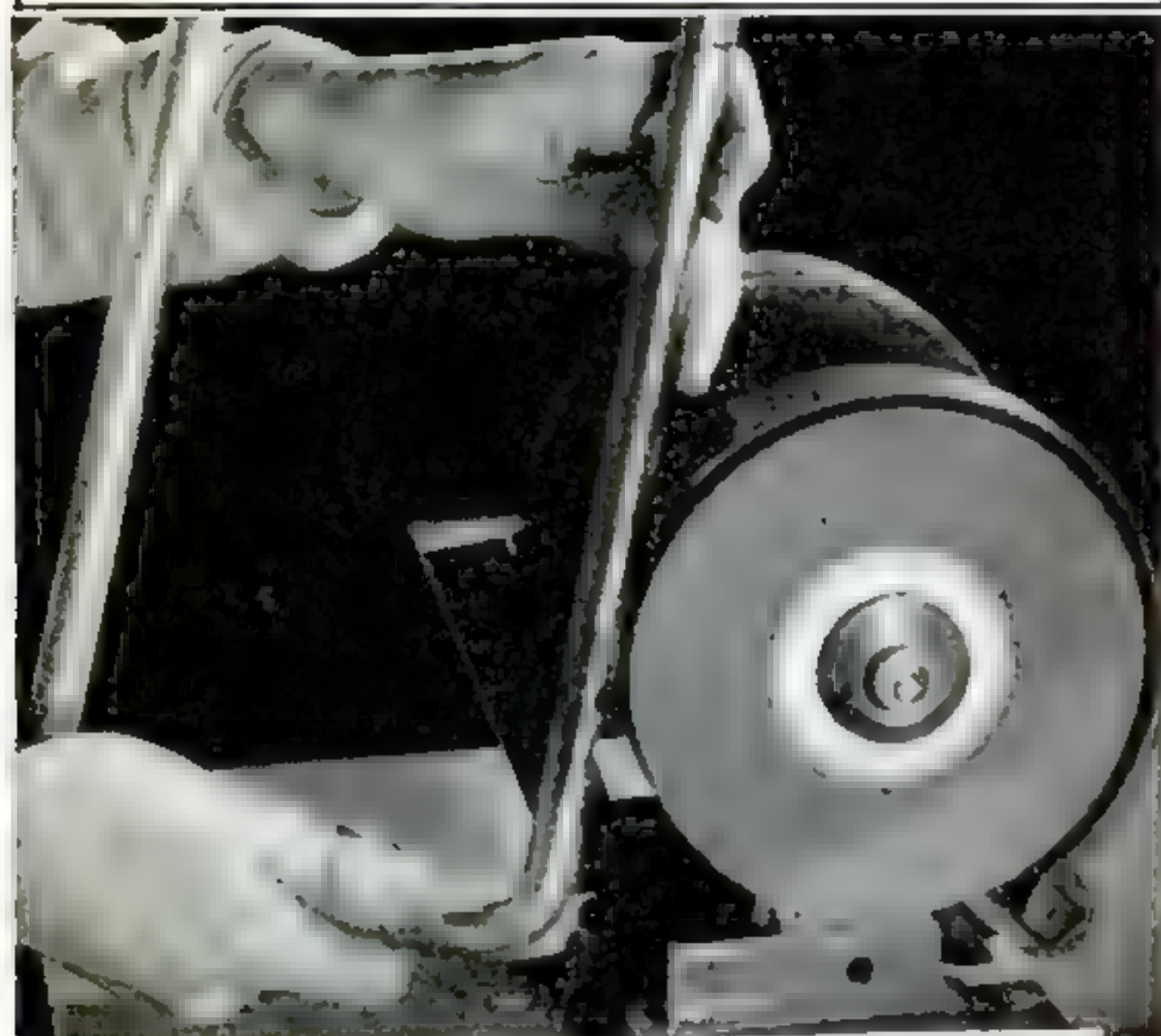
Name

Address

City..... State.....

☐ Check here if you are a Delta user now.

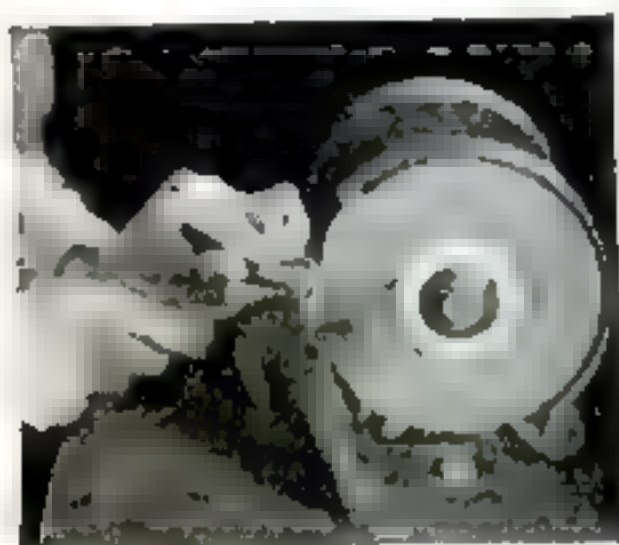
SHORT CUTS FOR THE CRAFTSMAN... NO. 2



How to smooth a WELD

You can make a welded joint as smooth as can be, simply by doing these two things. Remove excess metal with an Aloxite Brand Aluminum Oxide Grinding Wheel. Then finish it off by smoothing with a Carborundum-made slip stone or Aloxite Brand Aluminum Oxide Cloth.

You can use the same Carborundum-made wheel to put a keen, sharp edge on a drill bit or to sharpen wood-working tools such as gouges, chisels and small parting tools.



Send 20c (coin or stamps) for handy pocket sharpening stone and revised 95-page illustrated manual. It gives a hundred helpful hints on how to save time and effort by using Carborundum Brand abrasive products.

Write Dept. PS 12-8 for booklet and free stone

THE CARBORUNDUM COMPANY, Niagara Falls, N.Y.

REG. U. S. PAT. OFF.

(Carborundum and Aloxite are registered trade-marks of The Carborundum Company.)

CARBORUNDUM

REG. U. S. BRAND PAT. OFF.

ABRASIVE PRODUCTS



Suggestions for Gifts

(Continued from page 236)

Elizabethan Galleon REVENGE, 21" hull, 206-207-208-209	1.00
Fishing Schooner WE'RE HERE of "Captains Courageous," 9½" over all, 351-R.....	.50
Gettysburg Cannon, 11½" long, 292A-293A.....	.75
H. M. S. BOUNTY, 8½" hull, 254.....	.25
Liner NORMANDIE, 20½" hull, 264-265.....	.50
Liner QUEEN MARY, 10½" hull, 283.....	.25
Locomotive Hudson type, HO gauge, 14" long, driven by 6-volt motor, 329-330-R.....	.75
NOURMAHAL, power yacht, 8½" hull, 276.....	.25
Ocean Freighter, 14" hull, 271.....	.25

(Construction kits are available for some of these models. Turn to page 240.)

MISCELLANEOUS

Acrobatic Monkeys Toy, One-Legged Table, and Hat and Coat Rack, 248A.....	.25
Baby's Crib and Play Pen, 26 .....	.25
Birds and Animals, jig-saw patterns, 56 .....	.25
Cigarette Holder, designed in form of miniature three-gun naval turret, 299A.....	.25
Colonial Design Doll's House, 72.....	.25
Doll's House Furniture, 73.....	.25
Electric Teacher, (question-and-answer game), 302A.....	.25
Mexican Patio Furniture for Dolls—covered-wagon couch, roll-around couch, umbrella table, and garden cart, 354A-355A.....	.50
Microscope Kit, portable, 220.....	.25
Naval Gun Model (3"), Boy's Coat Rack of Indian Design, and Copper Brooch, 346A.....	.25
Projector for Photos and Pictures, 259A.....	.25
Six Simple Block Puzzles, 65.....	.25

RADIO

All-Wave Portable Receiver, 2 tubes, battery operated, 217-R .....	.50
Amateur Short Wave Receiver, 3 tubes, battery or 110-volt A.C. or D.C. operation, 155.....	.25
Full Electric Headphone Receiver (can be made compact for portable use), 130.....	.25
One-Tube Receiver, battery operated, 103.....	.25
Short Wave Converter; a full electric unit that allows short-wave reception with high-grade broadcast receiver; attaches to antenna post of receiver, 137 .....	.25

BOATS

All-Purpose Boat, 11' 5" long, weighs 100 lb., for sails, outboard motor, or rowing, 331-R.....	.75
Camper's Utility Boat, 11' 2" long, canvas-covered, for outboard motor or rowing, 281-R.....	.50
Canvas-Covered Duck Boat, 13' 6" long, 279-R.....	.50
Fisherman's Outboard Boat, 9' 3" or 11' 6" long, weighs 115 or 160 lb., for motors from 3 to 16 h.p.; can also be rowed, 344-345-R .....	.75
Motorboat-Rowboat, 13' long, decked hull, for use with outboard or inboard drives, 147-R.....	.50
Outboard Racer, 10' 4" long, weighs 114 lb., for class "A" and "B" motors, 211-212-R .....	.75
Racing Sailboat BLACKCAT, 13' 4" long, weighs 250 lb., Marconi rigged, 321-322-323-R.....	1.00
Sailboat, 12' long, weighs 200 lb.; has fast skimming-dish hull, 314-R.....	.50

Popular Science Monthly

353 Fourth Avenue, New York

Send me the blueprint, or blueprints, numbered as follows:

I am inclosing.....dollars.....cents

Name.....

Street.....

City and State.....

(Please print your name and address very clearly.)

2400° F METAL FOUNDRY

FOR SCHOOL WORK SHOPS OR HOME

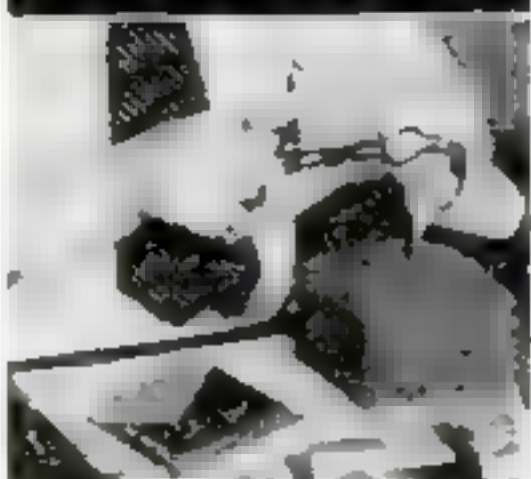
Outfits consist of Gas Furnace, Electric Motor Blower (110 Volt AC or DC), Crucibles, tongs, moulding sand, flask, hose, etc., including full instructions. Fun and profit casting models, jewelry, statues, art objects out of aluminum, copper, bronze, silver, gold, etc. Practical for casting shop equipment tools, for forging, case hardening, heat treating steel and developing new alloys and new materials for plastics.

No. 351—6 cu. in. cap. \$13.50, No. 352—12 cu. in. cap. \$19.00, No. 353—24 cu. in. cap. \$27.50.

Check or M. O. acceptable, Express Charges C. O. D.

KANSAS CITY SPECIALTIES CO. Dept. D Box 6022 Kansas City, Mo.

COMPLETE OUTFIT FOR CASTING AND HEAT TREATING



Write for Free Circular

CANNED WOOD MAKES HOME REPAIRS EASY



What Have You Got to Fix?

You can do a fine job of repairing holes in tile, broken chairs, loose casters, cracks, etc., with this canned wood that handles like soft putty and quickly hardens into wood. You can paint it, carve it—drive nails and screws into it. It's wonderful. It's PLASTIC WOOD. Try it. Results will surprise you.

Paint, hardware, 10¢ stores sell PLASTIC WOOD in 10¢ and 25¢ tubes, and also in 35¢ cans.



PLASTIC WOOD

PROVED BEST IN EVERY TEST!

MAKES QUICK REPAIRS

Quickly, permanently joins and repairs china, glass, wood, celluloid, etc. It's Transparent—yet sets like granite.

Also available in Metal color. At paint, hardware, 10¢ stores.



Old English CEMENT

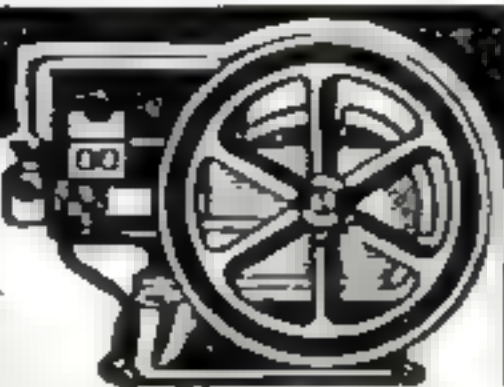
ENGINES

Enclosed, Self-Oiling, Roller-Bearing

Cheapest reliable power for farm or factory. Uses all fuels for pumping, sawing etc. Best engine for the money. You Pay Less to Own it—Less to Run it. Cash—Terms—Catalog FREE

WITTE ENGINE WORKS

2229 Oakland Ave.



KANSAS CITY, MO.

MODEL SHIP & YACHT FITTINGS

Complete fittings and construction sets for all popular models. Sails, hulls and all fittings for model racing yachts. Send 20c (coin) for latest. Illustrated catalog. Shows hundreds of items you need.

A. J. Fisher,

1002-2 Etowah Ave.,

Royal Oak, Mich.

50 PIECE UNIVERSAL ARBOR TOOL SET 95c

Indispensable to Jeweler, will fit most grinders. Laboratory, Model Maker and Home Craftsman. The ideal outfit for fine accurate grinding, sanding, routing or carving. Includes 12 grindstones with brass centers in assorted sizes, 6 bakelite cut-off wheels, 5 assorted engraving, routing or carving burrs, 2 polishing buffs, 1 mounted point, 2 bristle polishing brushes, circular and cup shape, 8 mandrel arbors, 20 assorted sanding discs of emery, garnet, sand, fine, medium and coarse. Send Coin or Money Order * Shipment Prepaid

Philadelphia Machinery Co. Dept. P. S. 118 N. 6th St., Phila., Pa.



GET YOUR TRACTOR AT FACTORY PRICE



Air Tires or Steel Wheels

Amazing money maker for farms, truck gardens, orchards, nurseries, poultry ranches, country homes, etc. Plows, discs, harrows, cultivates, mows lawns, cuts weeds. Runs belt machinery. 2 to 5 H. P. riding or walking types. Write for FREE CATALOG. Low Factory Prices and 10 day Trial Plan. Address Nearest Office.

SHAW MFG. CO., 5712 Front St., Galesburg, Kans. 130 PS West 42nd St., New York, N. Y. 5812 PS Magnolia Ave., Chicago, Ill., 668 PS North 4th St., Columbus, O.

SHAW BU-ALL TRACTOR

ARCADE Low Cost POWER TOOLS

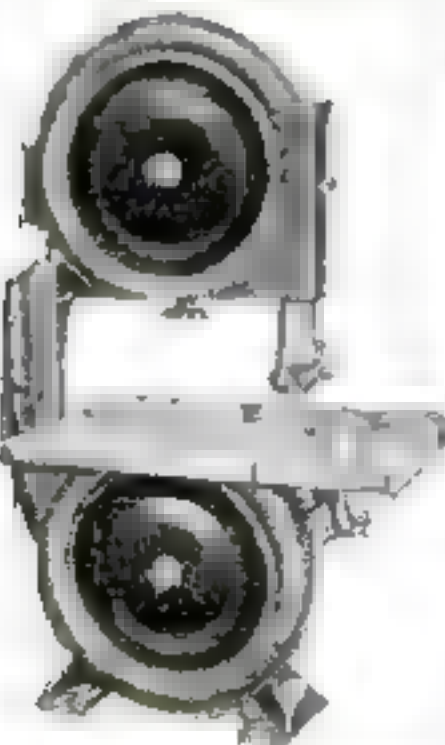
Compare These Prices

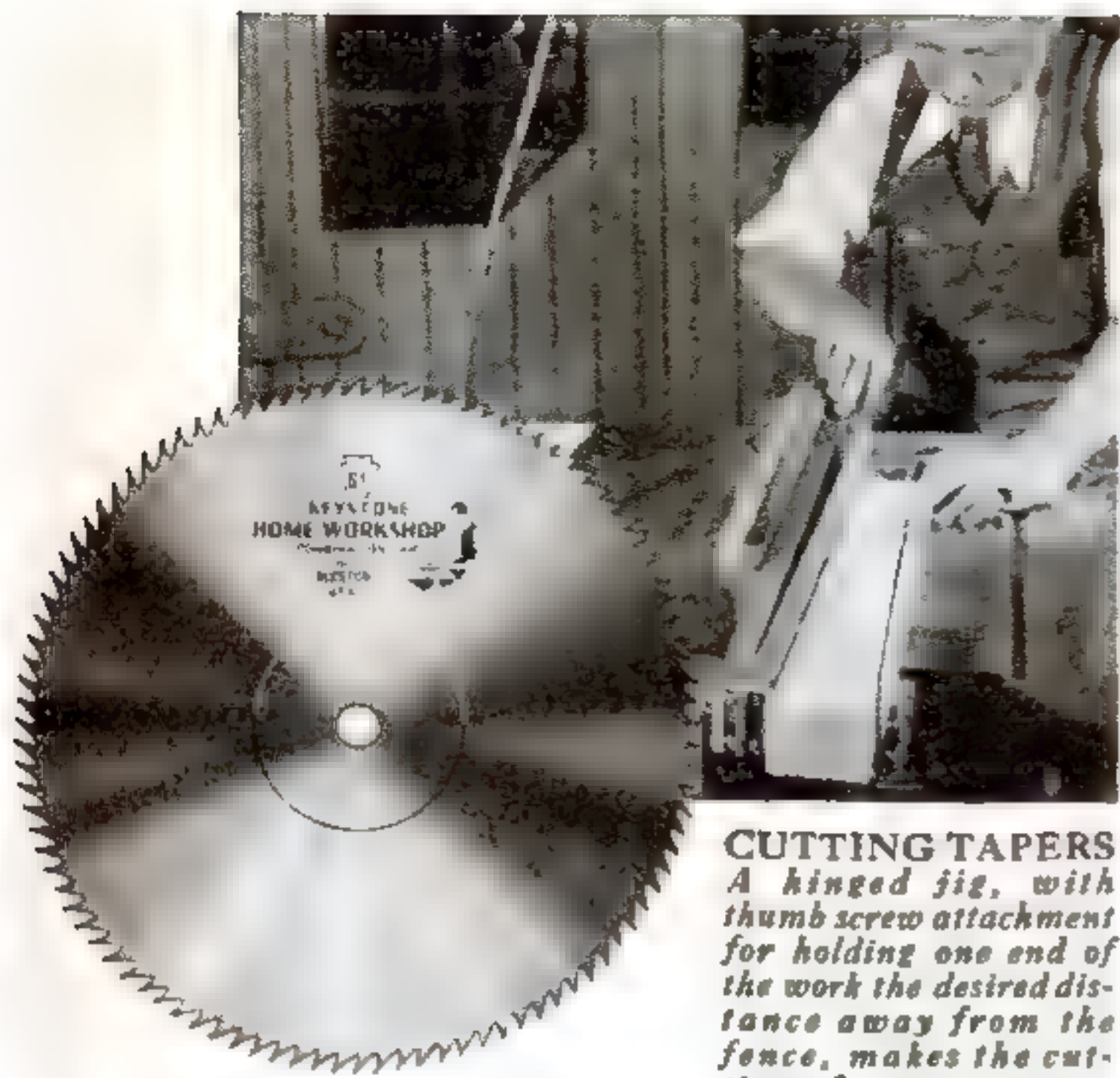
Drill Press, 15" high, \$5.30; Disc Sander, 8 1/2", \$5.00; Jig Saw, 10" throat, \$5.30; Belt Sander, 4"x4" drums, \$8.00; Lathe, 8" Swing, 30" between centers, \$9.50; Band Saw, 10", \$18.00; Bench Saw, 6" blade, \$11.00; Bench Saw, 8" blade, \$25.00. Prices west of Rockies slightly higher.

Also other Bench Tools, Model Makers and Accessories at very attractive prices... all quality built for long service and accurate workmanship. If dealer cannot supply, order direct. Write for

FREE CATALOG

Arcade Mfg. Co., 1218 Shawnee St. Freeport, Illinois





CUTTING TAPERS
A hinged jig, with thumb screw attachment for holding one end of the work the desired distance away from the fence, makes the cutting of tapers accurate and easy.

Amazing money's worth **KEYSTONE** made by **DISSTON** **CIRCULAR SAWS**

Very little money buys a dependable blade ... a **KEYSTONE** Circular Saw—made by **DISSTON**! Expert sawmakers designed these saws specially for fine craftsmanship, at low cost, in your home workshop.

Keystone Saws are amazing values—\$1.70 to \$2.40 for 6" to 10" sizes. They fit your machine and suit your work. Run true, stay sharp. Ask your dealer for Keystone Home Workshop Circular Saws—made by Disston.

<i>Cross-Cut; Rip; Combination</i>			
6" (1/2" hole)	\$1.70	8" (1/2", 5/8", 3/4" hole)	\$2.00
7" (1/2" hole)	\$1.80	10" (5/8", 3/4" hole)	\$2.40
Rip Saws slightly less			
Also Hollow Ground, \$3.00 to \$5.00			



Also **KEYSTONE** made by **DISSTON** Hand Saws. Skew-back and straight, cross-cut and rip. Prices, \$1.00 and up. K-3 "Pacemaker," skew-back, 26" blade, \$1.50. Prices slightly higher in Canada.



FREE BOOK SEND COUPON

For free copy of "Disston Saw, Tool and File Manual"—tells how to sharpen all kinds of saws, send this coupon to:

HENRY DISSTON & SONS, INC.
1210 Tacony, Philadelphia, U.S.A.

Name.....

Address.....



IF HE ENJOYS MAKING THINGS ... GIVE HIM **A Construction Kit for Christmas**

OUR construction kits make excellent gifts for those in your family, or among your friends, who enjoy making things. Each box contains the raw materials for building some famous ship model or other unusually interesting project, and all the necessary blueprints and instructions are included. Prices range from 50 cents to \$9.95.

Incidentally, there is still time to make a piece of furniture or one of our simpler ship models yourself, if you prefer to give the finished article as a present. The complete list follows:

SIMPLIFIED SHIP MODEL KITS

F. Liner S.S. MANHATTAN, 12" long.....	1.00
H. Cruiser U.S.S. INDIANAPOLIS, 12" long	1.50
J. Clipper SEA WITCH, 9 1/2" hull, 13" over all....	1.50

STANDARD SHIP MODEL KITS

A. Whaling ship WANDERER, 20 1/2" hull, 27" over all	7.40*
D. Spanish galleon, 24" hull, 30" over all.....	6.95*
E. Battleship U.S.S. TEXAS, 3' long.....	7.45*
G. Elizabethan galleon REVENGE, 25" hull, 28" over all	7.25*
L. Farragut's flagship HARTFORD, steam-and-sail sloop-of-war, 33 1/2" hull, 41" over all	8.45*
Q. Privateer SWALLOW, a Baltimore clipper, 12 1/2" hull, 20" over all	4.95†
V. Clipper SOVEREIGN OF THE SEAS, 20 1/2" hull, 26" over all.....	4.95†
Y. Trading schooner, Maine type; 17 1/2" hull, 22 1/2" over all	4.90†
2S. U.S. Navy destroyer PRESTON, 31 1/2" long	5.95*
3S. CONSTITUTION ("Old Ironsides") 21" hull, 31" over all.....	6.50*
4S. Clipper ship GREAT REPUBLIC, 31 1/2" hull, 42" over all.....	8.40*
5S. Coast Guard Patrol of 165-ft. type, 20 5/8" long (same as President's yacht POTOMAC).....	4.95*
6S. Brig MALEK ADHEL, 20" hull, 33" over all; frame-and-plank construction	9.75†

(Continued on page 242)

SCALE MODEL TRAINS

MIN-I-
SCALE
MODELS
"O"
GAUGE



KITS

Locomotives	\$47.50
Passenger Cars	8.50
Freight Cars	5.00

Perfect, die cast scale models, accurate to the smallest detail. Absolute scale accuracy. Sturdy construction. Precision workmanship. All locomotives "run-in" under power. Locomotive, 25 1/2"; Pullman, Baggage and Day Coach, 22"; Box car and Hopper, 12". Tank, 10 1/2". Kits assembled easily without drilling or machining. Send 3c stamp for full information.

CONGRESS TOOL & DIE CO.

9030 Lumpkin Ave.,

Detroit, Mich.

**FREE
FOLDER**

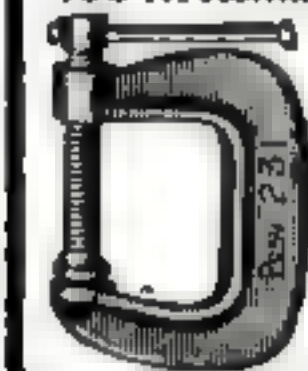
CLAMPS

Use more clamps as "helps" for firmer joints, for setting-up, for accurate drilling, sawing and joining, for holding, drawing-in and lifting—you can't have too many good clamps, and "Jorgensen" and "Pony" Clamps are the very best. Those illustrated have been selected for the home work shops.

ADJUSTABLE CLAMP CO.

408 N. Ashland Ave.

Chicago, U. S. A.



Pony Mini-
atures 9 types
—1" to 2 1/2"
cap. Not toys
but fine tools
with 100 uses.

Pony "50" Fittings
go on ordinary 3/4"
pipe. Any length.
Send \$3.00 plus post-
age (8 lbs.) for fittings for two "50"
Clamps. Also "Pony" No. 52 Fittings for
3/4" pipe—2 sets for
\$1.50 plus postage.

Catalog FREE



Jorgensen
Handscrews

Genuine "Jorgensen"
Handscrews grip at all an-
gles, never slip, split or loos-
en. All sizes. Send \$3.20
plus postage (7 lbs.) for 2 No.
1 Handscrews—open 8".

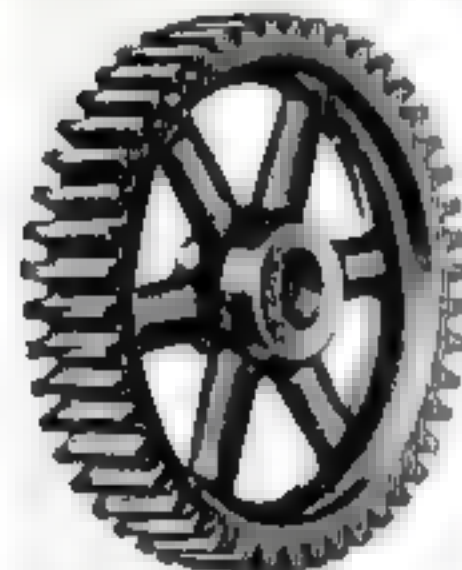
BIG NEWS FOR MODELBUILDERS & HOMECRAFTSMEN

in the values and prices featured in the great new C-D Hand-
book Catalog—now ready! Bargains galore. Thousands of items
—including 135 world-famous C-D flying model airplanes; also
other makes, 10c up. Also O, CD, OO and HO gage model RR
equipment, and toy trains at 20c up. Gas model airplanes, and
all well known gas engines; hand tools, power machinery, ship
kits—and all necessary supplies. Microscopes, etc. Noth-
ing ever like it before. Edition limited, so act at once. **10¢**
All for only

Cleveland Model & Supply Co., Inc.

4508-B23 Lorain Ave.

Cleveland, Ohio



GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust
bearings, flexible couplings, pulleys, etc. A
complete line is carried in our Chicago stock.
Can also quote on special gears of any
kind. Send us your blueprints and inquiries.
Send 10c for Complete Catalog No. 214

CHICAGO GEAR WORKS

769-773 W. Jackson Blvd.

CHICAGO, ILL.



The IDEAL GIFT!

For machinists and toolmakers, diemakers and pattern-
makers. You can easily choose yours from Free Catalog.

GERSTNER TOOL CHESTS

538 Columbia St.

Dayton, Ohio



FREE ELECTRICITY

Wind driven car generator gives free Lights and
Radio reception anywhere. Homebuilt instruction
plans, made to cost less than \$1.00. One wire electric
fencer from Ford coil. Send 25c for copyrighted booklet.

WESCO, 902 Terminal, Minneapolis, Minn.



ELECTRIC FUN! 200 stunts with 110 volts. Book tells how to make
arcs, motors, buzzers, floating rings, window displays, electric
magic etc. **\$1.00**

HIGH VOLTAGE FUN! Companion book of 200 advanced experi-
ments. **\$1.00**

SPECTROSCOPE quickest, surest way to analyze chemicals or ores
with chart to identify elements and book of 100 experiments **\$2.50**

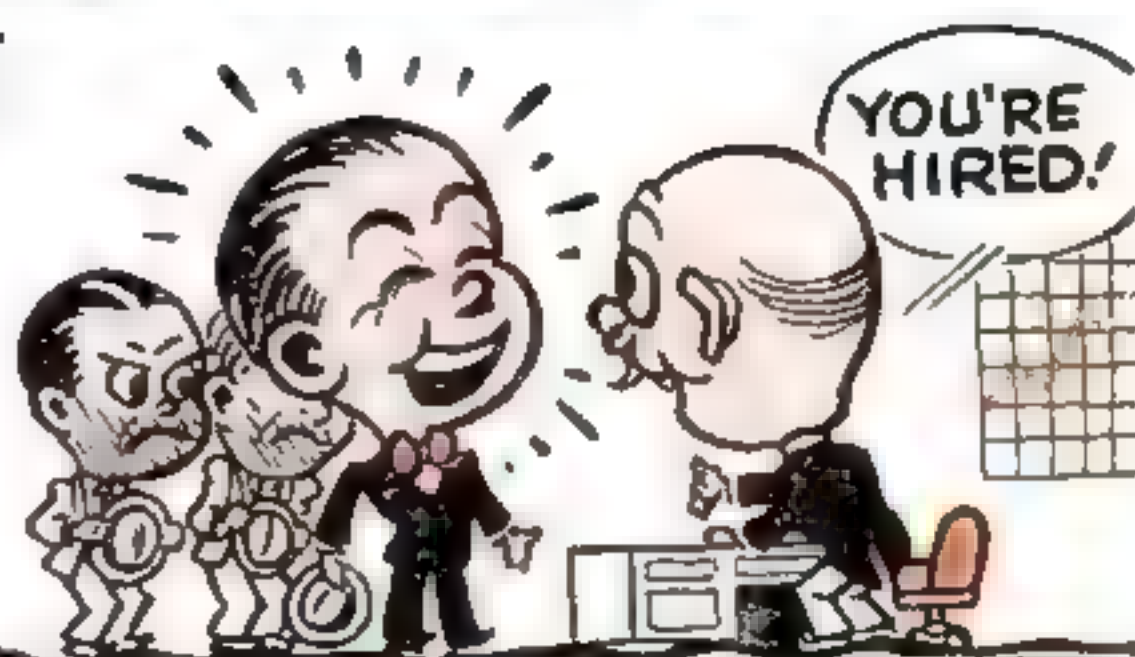
STROBOSCOPE with 110 volt motor, neon lamp and book of 100
experiments **\$1.00**

MAGIC Phosphorescent Rod glows in the dark in 8 colors **\$1.00**

CUTTING & SONS 128 S Street Campbell, Calif.

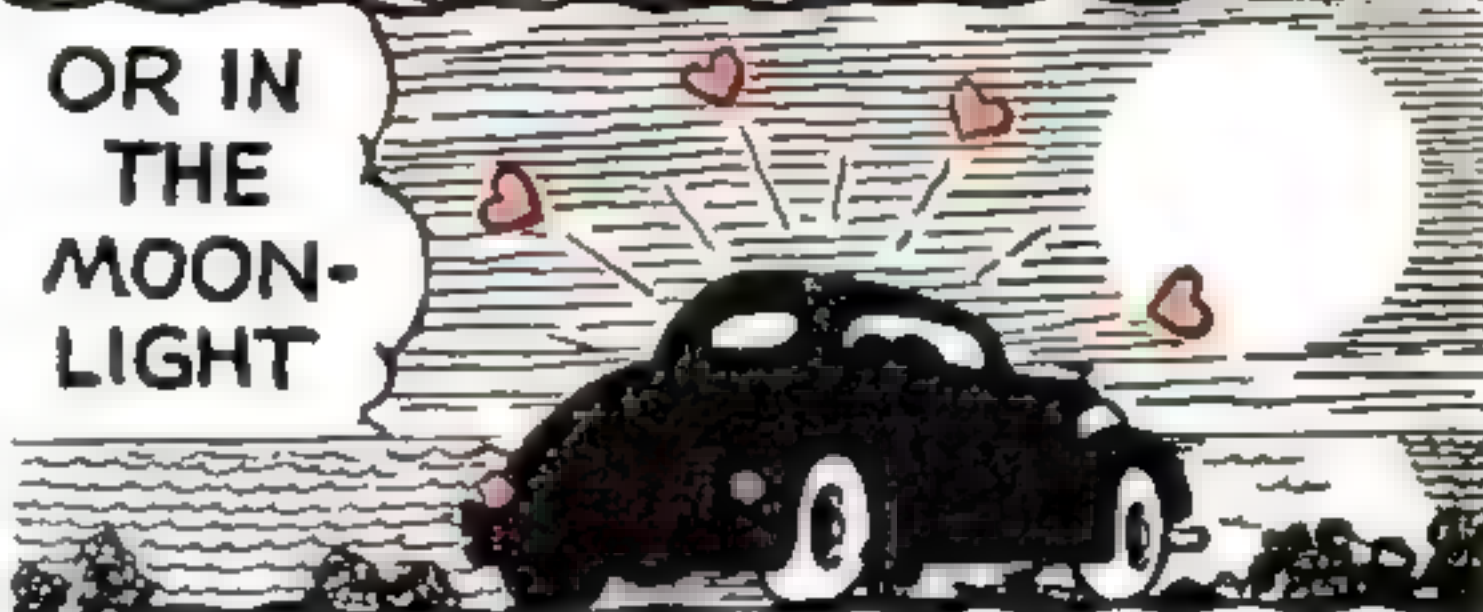
Treet Topics

IN THE
SPOT-
LIGHT



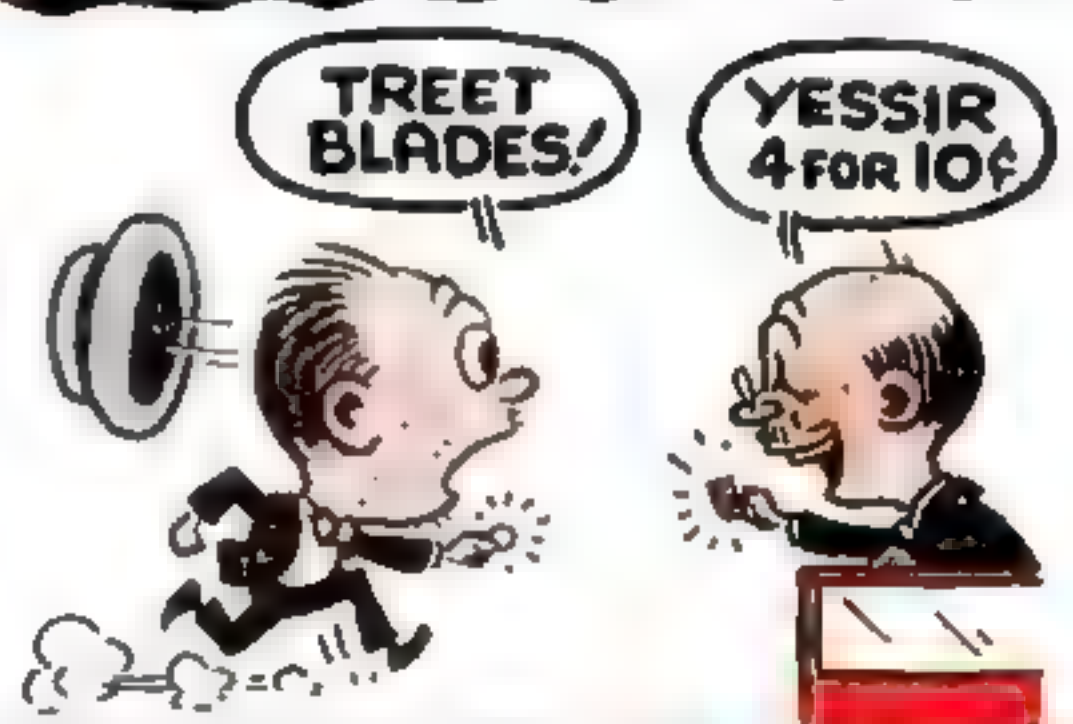
YOU'RE
HIRED!

OR IN
THE
MOON-
LIGHT



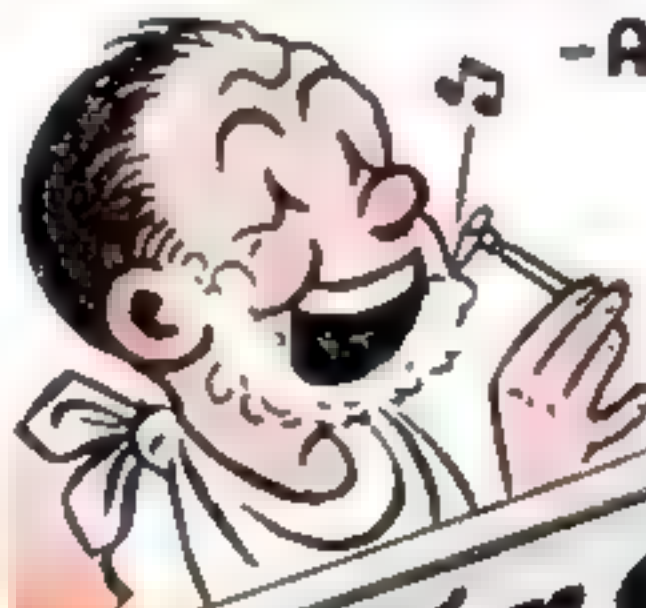
YOU CAN WIN
BY A
CLOSE SHAVE!

SO DO
THIS:-



TREET
BLADES!

YESSIR
4 FOR 10¢



-AND TREET YOURSELF
TO A PACK OF
PERFECT SHAVES!



Treet

FOR GEM AND EVER-READY RAZORS

Treet Safety Razor Corporation, Newark, New Jersey

The Hobby of Hobbies

for Young Men and Old Men---

Yes, the ace of hobbies for Young and Old. You will think so too, after you have finished your first piece of WOODCRAFT ...

It's an absorbing hobby. Throughout your life, you can make lovely livable furniture, also lamps, bookends, etc. Start with saw, plane, chisel or with \$1.98 scroll saw outfit.



And
a
Money
Maker

The
Craftsman's
new catalog
No. 11
is a veritable
storehouse of
up-to-date
facts for
Woodworkers.

Only
10¢

Wood Working Secrets

This remarkable 136 page catalog brings you the latest ideas, and startling bargains!

For example Deal No. 38

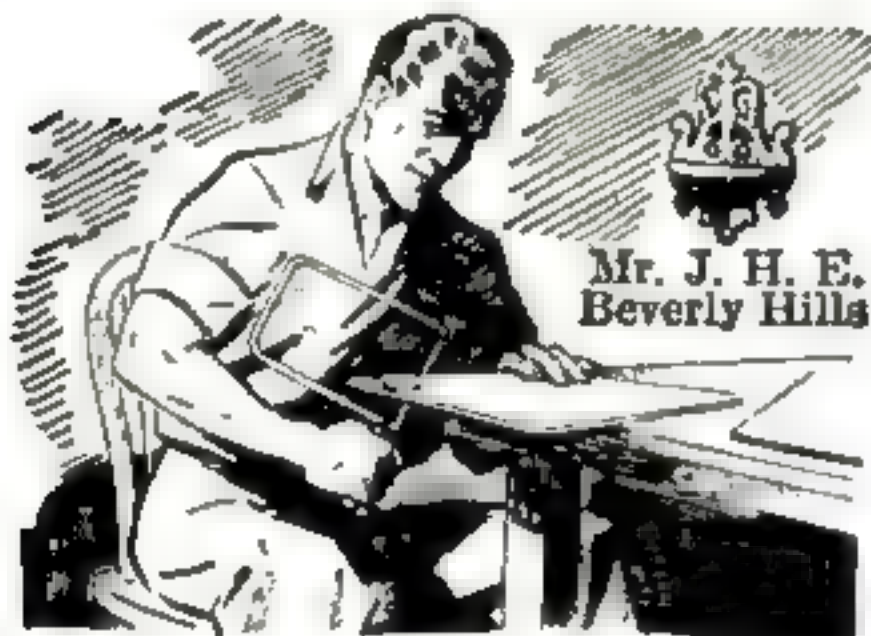
- 4 ft. - 1/4 in. West African Iroko (light brown)
- 4 ft. - 1/4 in. Australian Lace Wood (silky brown flaked)
- 4 ft. - 1/4 in. Central African Benin (golden brown)
- 4 ft. - 1/4 in. North American Walnut (slate color)

All
for
\$4.50

All woodworkers appreciate this: 20 different kinds of American woods in neat box, each piece 2 1/2" x 5", 1/4-inch thick, each neatly labeled. (Wonderful for reference, used in many schools. All the wood pieces can be used up any time in actual wood working.)

Deal
Set
No. 4
All
for
\$1.00

A Bargain for Beginners: Deal No. 101, only \$1.98. High quality scroll saw, one dozen saws, choice of Mahogany or Walnut for two corner pieces, 2 blue prints, all needed hardware. Total \$1.98.



Mr. J. H. E.
Beverly Hills

THIS man started with a \$1.98 scroll saw outfit. (See Deal No. 101 in left hand corner.) Now the same man has a complete work shop in his basement.

PAGE after page of NOVEL and rare, hard-to-find, imported woods from all over the world.

Complete list of all Standard American Woods, cut to convenient sizes without waste. Big Bargains!

Also large assortments of attractively designed legs, carved decorations, mouldings, plain and ornamental hardware of all descriptions.

Exquisite card table tops, matched veneers. 301 Scroll Saw Patterns; 235 are brand new!

The catalog explains the new Craftsman Art Inlay Process. So easily learned.

And—new pointers on correct wood finishing! A valuable hint on the correct use of glue.

Scores of other pointers on the "how" of woodworking!

This is but a partial list of contents, all for only 10c. Write while this edition lasts!

Give Kits This Christmas

(Continued from page 240)

- 8S. Fishing schooner BLUENOSE, 17 1/2" hull, 22" over all 4.95†
- 9S. New Bedford whaleboat, with complete equipment, 14" long..... 2.75†
- 10S. Confederate raider ALABAMA; steam sloop, bark rigged; 21 1/2" hull, 28" over all..... 8.20*

MODEL-OF-THE-MONTH KITS

- M. Aircraft carrier SARATOGA, 18" long.....\$1.00
- N. Convoy of four U.S. destroyers, each 8 1/4" long .75
- R. U.S. cruiser TUSCALOOSA, 11 3/4" long..... 1.00
- U. HISPANIOLA of the book and movie "Treasure Island," 7" long.50
- Z. H.M.S. BOUNTY, 8 1/2" hull, 11 1/2" overall..... 1.50
- 2M. Ocean freighter, 14" long..... 1.50
- 3M. Yacht NOURMAHAL, 8 1/2" long..... 1.00
- 4M. Oil tanker, 14" long..... 1.50
- 5M. Liner PRESIDENT LINCOLN, 14 3/4" long .. 1.50
- 6M. Fishing Schooner WE'RE HERE of "Captains Courageous," 9 1/2" over all..... .75



You can construct a locomotive with Kit 1L

MODEL RAILWAY KITS

- 1L. HO-gauge, Hudson-type model locomotive and tender, 14" long 9.95*
- 2L. Supplementary power unit for locomotive 1L; consists of 6-volt motor and worm and gear 4.50
- 3L. HO-gauge track kit. Contains raw materials for making 25 ft. of track..... 4.00*
- 4L. Deluxe track kit. Same as 3L except that kit contains third-rail chairs..... 6.95*

MISCELLANEOUS

- 4. Solid mahogany book trough..... 5.30*
- 5. Solid rock maple hanging wall rack..... 5.75*
- 7. Whittling kit with two shaped blocks for making sea captain 5 1/2" high..... 1.50
- 8. Whittling kit for six different Scotties; each is 2" by 2 1/4", sawed to shape..... 1.00
- 10. Copycraft whittling kit for making one of several Hobo Hank novelties. Includes master model 5 3/4" high..... 1.50
- 12. Marionette kit for making a model of Dopey the Dwarf, 9" high. Hand-painted head and complete parts, ready to assemble..... 2.25†

Note: If you live west of the Mississippi River or in Canada, add 50 cents to prices marked with an asterisk (*) and 25 cents to prices marked with a dagger (†).

Popular Science Monthly, Dept. 128A
353 Fourth Avenue, New York, N. Y.

Please send me C. O. D. Kit.....

I will pay the postman the price shown above plus a few cents postage in full payment. (Canadian orders cannot be sent C. O. D.).

Name.....

Address

City State.....

(Please print your name and address very clearly)

If you prefer to send your remittance with this order, you save the C.O.D. charge. Remit by money order, check, or registered mail. This offer is made only in the United States and Canada. Also see note above.

Write for this Book

CRAFTSMAN WOOD SERVICE CO., 2729 S. Mary St., Chicago.

I enclose 10c (stamps or coin) for which please send new 136-page Bargain Catalog No. 11 for Woodworkers.

Name Age.....

Street and No.

Town State.....

If you also want to order one or more of the deals from this advertisement, state Deal No.....

Enclose full amount ☐ or \$1, balance C.O.D. ☐

Money back if not 100 per cent satisfied.

MEGOW'S GAS-POWERED MODEL AIRPLANE

The Cardinal

World's champion Bassett's new 48" gas-powered crackup-proof sensation! Finished prop., many ready-made parts, rubber wheels. Also the famous QUAKER FLASH, FLYING QUAKER and others. Also rubber-powered Giant Flyers with motor-hum device \$1.00 up.

\$3.95

plus 20c post.



SHIPS . . . carved hulls, many ready-made parts, complete plans and materials. XEBEC (Rob. Crusoe); HISPANIOLA (Treasure Island) ARABELLA (Capt. Blood) and others, \$2.00 (15c postage).



XEBEC

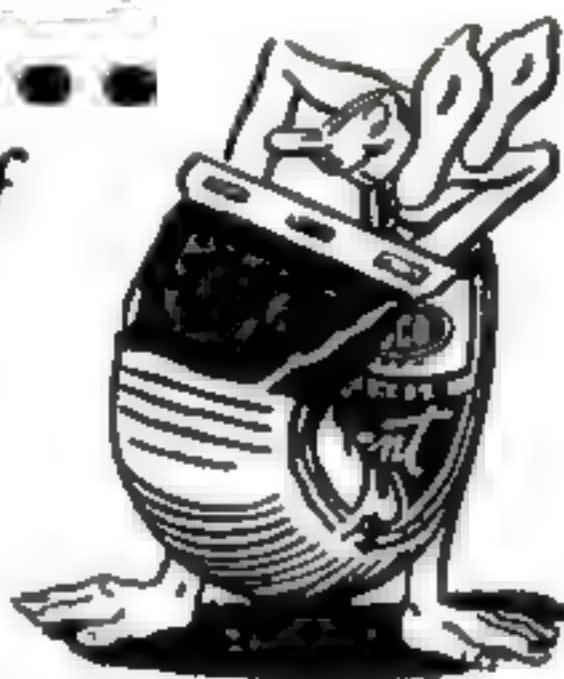
HO-GAUGE MODEL RAILROADS. Most realistic freight cars, 50c. Send 5c postage for 100-page illustrated catalog Model Kits, ready-made parts and supplies.

MEGOW'S Dept. PS—Howard & 6th Sts. Philadelphia, Pa.
or 217 N. Desplaines St., Chicago, Ill.

FLEXIBLE...

transparent, waterproof

● Holds permanently on china, glass, wood, metal, leather, paper, fabrics. Not affected by heat, cold, moisture. Dries quickly. Ideal for model making, as well as for mending.



DUCO CEMENT

PRACTICAL MAGNIFIERS

FOR EVERY PURSE AND PURPOSE

Sizes 1½" dia. to 5" dia. lens. Prices, 50c to \$10. Send for FREE Catalog of these attractive, well-built instruments.

Dealers' Inquiries Invited

THE MAG-NI-LINE PRODUCTS

3456 E. Jefferson

Detroit, Mich.



\$1.50

At Electrical Stores or Post-paid



"THE NEON LIGHT sets you RIGHT" TEST-O-LITE

Handiest electrical tester made; quickly locates trouble in electric circuits, fuses, cut-outs, motors, radios, etc. Has 1,001 uses for electricians or home. Tests any voltage 110 to 550; tells A.C. from D.C. Excels ordinary clumsy test bulb. Fountain-pen size; with pocket clip. Lifetime guarantee.

L. S. BRACH MFG. CORP.

57 Dickerson St.

Newark, N. J.



Spindle SHAPER \$3

less cutters (C.O.D. or outside U. S. \$3.25) Postpaid

Make tongue and groove joints; shape mouldings, picture frames, plaques, etc. Limitless projects can be given a professional finish with this shaper. It has 8"x5½" steel table; stands 5½" high.

Uses standard 5/16" hole cutters. (Cutters 55c each). Oilless bearings. Your fractional H. P. motor runs it.

FREE CATALOG describing \$150 prize contest (1st prize, \$25; 2nd, \$15; 3rd, \$10; 66 other cash and merchandise prizes). Cat. illustr. complete power tool line: Jig Saw, \$1.50; Circ. Saw with oilless bearings, \$3; Drill Press, \$2.50; completely equipped Lathe, \$24.90; Sander, \$1; etc. Order today or send card for Catalog.

\$150 PRIZE CONTEST

J & N Metal Products Co. 3 Commercial St. Rochester, N. Y.

"MATCHED PAIR"

FOR THE MAN WHO SAYS

"My Shop deserves the Best!"



10"

GEARED POWER TILTING ARBOR SAW

Tired of playing with "toy" saws? Here's a big, rugged, precision-built tool! Direct Gear Drive delivers 30% to 40% more power

to the blade. Makes full 3" cuts—or move the saw arbor effortlessly to any angle up to 45° and cut through 2" with the table level. No belts, no pulleys—nothing but carefully machined parts, built to give years of carefree service. See it in the new catalog!



6" JOINTER WITH DUAL PURPOSE SAFETY GUARD

Clean, modern lines, tripleknives that plane at 12,000 cuts per minute—and a dual purpose guard that lets you plane boards to ribbon thinness or narrow stock down to minimum width—safely! Roomy tables, sealed ball bearings, protractor gauge that gives fine readings. Hand-finishing can never equal the work you do with this tool, whether you're planing, joining or rabbeting. See this Jointer in the new catalog!

FREE—Be one of the first to have the new Driver 1939 Catalog! 48 pages of pictures, specifications, prices on Driver Tools and Accessories. Send the coupon today!

DRIVER Engineered POWER TOOLS

Walker-Turner Co., Inc.,
2128 South Ave., Plainfield, N. J.

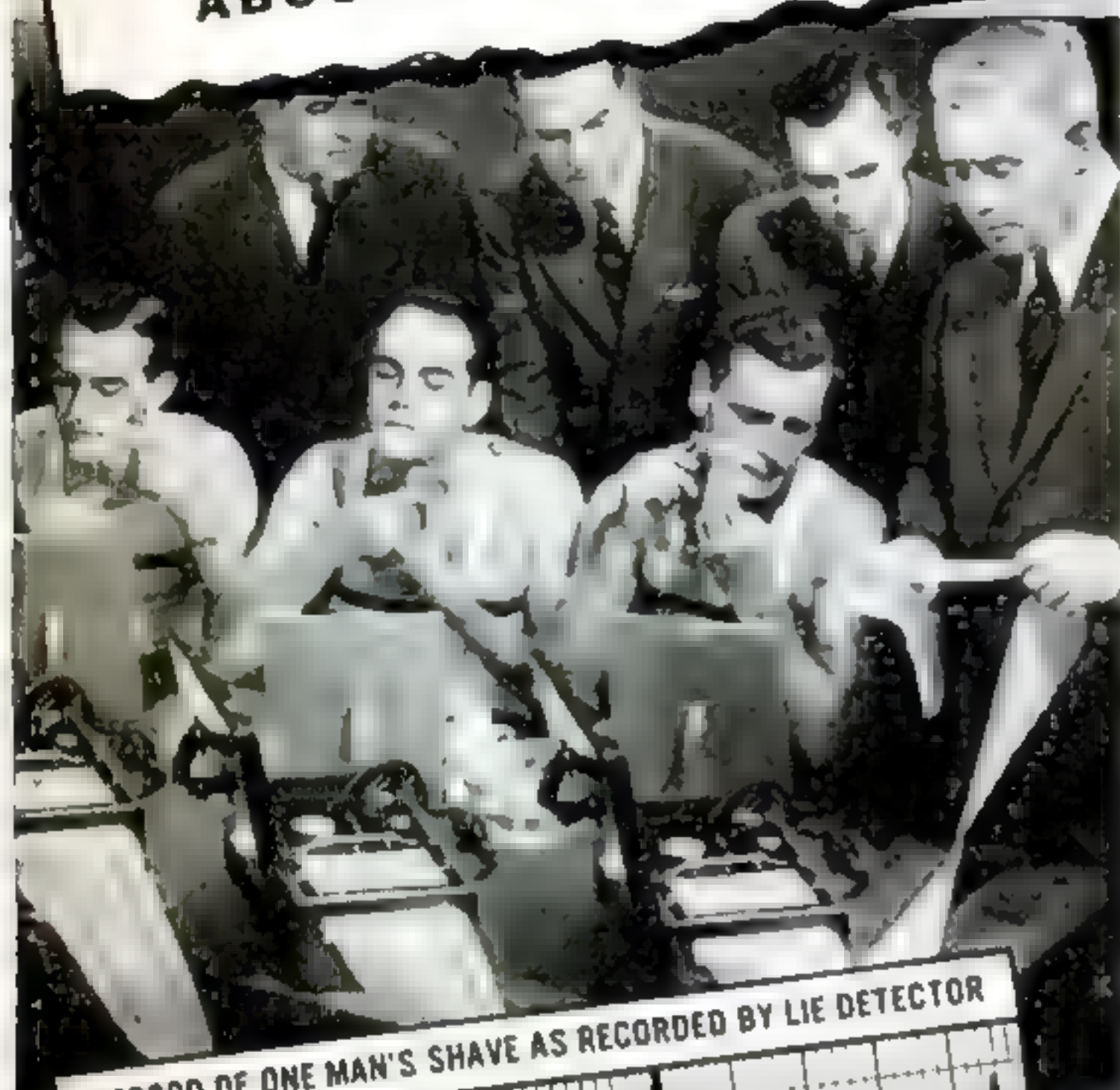
Rush me free copy of new 1939 catalog, describing tools, accessories, and motors.

Name.....

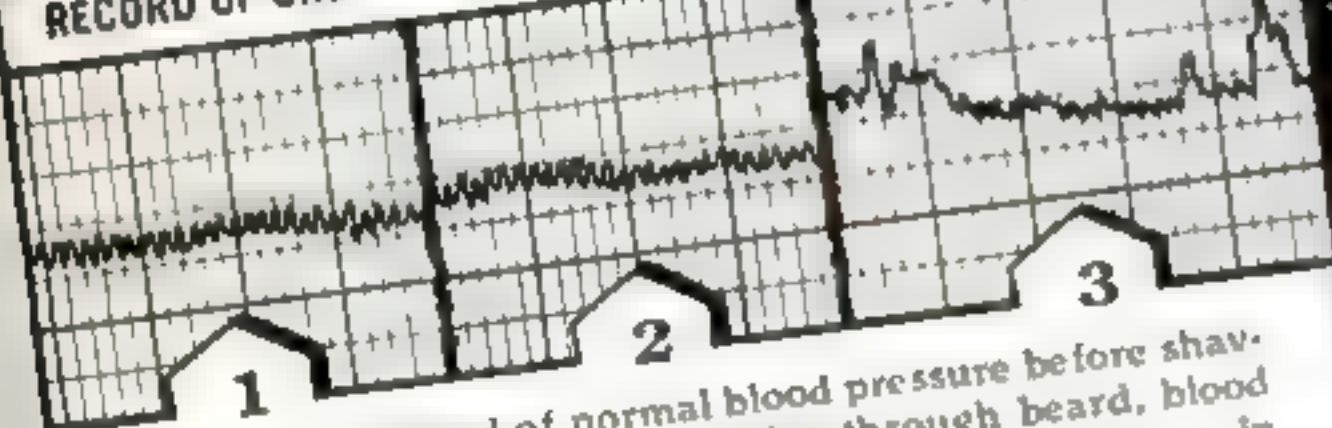
Address..... City.....

LIE DETECTOR "TELLS ALL"

REVEALS STARTLING FACTS
ABOUT RAZOR BLADES!



RECORD OF ONE MAN'S SHAVE AS RECORDED BY LIE DETECTOR



Above. (1) Record of normal blood pressure before shaving. (2) As Gillette Blade glides through beard, blood pressure remains almost normal. (3) Fluctuations in blood pressure as substitute blade drags and pulls.

TO BARE the facts about razor blade quality, Gillette retained Dr. William M. Marston, eminent psychologist and originator of the famous Lie Detector. Strapped to the Lie Detector... the same instrument used by police... these men shave one side of the face with a Gillette Blade, the other with a blade of different make—while their involuntary emotional reactions are recorded. Dr. Marston proves the Gillette Blade is far superior in every respect to substitute blades tested. You get shaves that are: 1. Easier. 2. Faster. 3. Free from irritating disturbances that can upset you for hours. Read the graph above. Weigh the evidence. Try a Gillette Blade yourself—and learn what a big difference it makes when you shave with a blade that's precision-made to fit your Gillette Razor exactly.

MORE SHAVING COMFORT FOR YOUR MONEY

Gillette Blades

PRECISION-MADE TO FIT YOUR GILLETTE RAZOR EXACTLY

"MILLION-DOLLAR"
SHAVES FOR LESS THAN
A PENNY A DAY

Gus Cures Winter Ills

(Continued from page 158)

"you ought to be the happiest guy in town. Coal orders can't be hard to get in this sort of weather."

Jim Jelliff smiled briefly. "Oh, the coal business is good enough," he admitted. "But something is radically wrong with my car. I'm afraid that fixing it is going to be an expensive job. Look it over, will you, Gus?"

"I certainly will," Gus assured him, "just as soon as you've told me what it is you want me to look for."

"There's something wrong with the oil," the young man said. "When I started out this morning, I noticed that my engine was making an unusual lot of noise. I'm always careful about my oil, and when I had it checked at a service station I nearly dropped dead when it took almost a complete refill to bring it up to the level."

"I was busy running around all morning. Two or three times, when I came out of some place to get in the car, I noticed that oil was dripping out of the bottom of the engine. That worried me, and early this afternoon I had the oil checked again, at another service station. Darned if she didn't take almost two quarts! The fellow who put it in said that he thought that instead of circulating the way it should, the oil was just shooting out of the motor—and, if so, I was in for a big job. So, as soon as I could get the time, I came along to you. What's the matter?"

Gus lifted the hood. Then he took the cap off the oil-filler tube—and began to laugh.

"Nothing to get gray-haired about, Jim," he reassured the worried young man. "All this job is going to cost you is what you paid for the oil you wasted. All that is the matter is that the moisture from the oil froze on this fine screen over the mouth of the filler tube. Your car doesn't happen to have a crankcase breather pipe, so the blow-by past your pistons builds up pressure that's been forcing oil out through your engine's main bearings."

"Well, here's your repair job!" He took a small screw driver out of his pocket and loosened up the steel wool that formed the filter. "These holes are too large to freeze over. You won't have any more trouble."

The clock in the office struck five. Gus yawned and stretched his powerful arms. "Quitting time," he said, grinning at Joe and Harry. "Well, another day, another dollar!"

Joe Clark glanced over the numerous job slips that he had taken out of the clip hanging over Gus's bench. "Quite a few dollars today," he said contentedly. "But of course you wouldn't think of that!"

NEW TYPE CHEAP OIL BURNER

Sweeping the Country!!

COOK and HEAT Without - Coal or Wood

In Your Present Stove or Furnace—
HOTTER—No Drudgery,
Dirt or Ashes—More Heat
Quick at SMALL COST.

OVER 40,000 SOLD

Beats any oil burner ever gotten out for low cost, perfect performance. Burns cheap oil a new way, without pre-generating or clogging up. Quick intense heat by Simple Turn of Valve.

30 DAYS' TRIAL

Prove its efficiency, convenience and economical operation.

Write Immediately for
**FREE BURNER
OFFER TO AGENTS**

**AGENTS
Salesmen
BIG MONEY**

F. Silver says: "I can
make \$1000 a month
KINGS before this
year ends." Sample
Burner FREE to pro-
ducers. Write us now
for agents' offer.



**Quick HEAT at
Turn of Valve!**

who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now, spare or full time—mail 1c postcard today.

UNITED FACTORIES, P-761, Factory Bldg., Kansas City, Mo.

NEW BIG STREAMLINED LATHE



**At An Amazing
Bargain Price**

Imagine! This extra heavy wood lathe, steel bed 48" long, at low prices. Heavy duty head stock, 4-step cone pulley for V-belt. No. 2 Morse Taper Centers. Sealed ball bearings. 8" face plate screws on to spindle. Tool rest 10" long. Complete line of accessories at amazing low prices. Write today for free catalog describing Blue Star full line precision woodworking machinery. Factory-to-you prices. Not sold through agents.

BLUE STAR PRODUCTS

512 Wood Ave.

Fairfield, Iowa

NEW Grinding Attachment

For 8" to 16" Metal Lathes. Build It Yourself.

At last, a precision grinder within your means. You save 2.3 by finishing our semi-machined castings, on your own lathe. HURON handles both internal and external grinding. Accuracies to .00025". Mirror finish easily obtained. Grinds valves, pistons, bushings, shafts, hard or soft, holes, lathe centers. Sharpens reamers, milling cutters. Does eccentric drilling; lops; polishes; scores of other uses, for home workshops, garages, machine shops. Write for FREE illustrated folder and full information.

Huron Machine & Tool Co., Dept. C-12, Yale, Mich. Only \$5.95



Semi-Machined Castings

OTTAWA LOG SAW



\$39

BIG BOOK FREE

PUTS THIS

OTTAWA

To work for you

MAKE MONEY! Wood is valuable. Saw 15 to 20 cords a day. Does more than 10 men. Ottawa easily operated by man or boy. Falls trees—saws limbs. Use 4-hp. engine for other work. Write for FREE book. **OTTAWA MFG. CO., 1301 Wood St., Ottawa, Ks.**

BUILD YOUR OWN HOME WORKSHOP

Old auto parts make wood lathe, metal lathe, jig saw, drill press, shaper, 10" circular saw. Save money. Plans, complete, for all 8 tools, only \$2.00, prepaid. Thousands satisfied. Send \$2.00 today. **B. J. MEZO CO., 8532 Vanderbilt, Dept. S, Detroit, Mich.**



TRAILER PARTS

Latest type heating stoves, window assemblies, couplers. Everything for the trailer. 40 page illustrated catalog, 10c.

MARVEL TRAILER PARTS CO., 19035 Celestine Ave., Detroit, Mich.

ONE-MAN SAWMILL



**TURN TREES INTO
MONEY WITH A BELSAW**

Three capacities: 10, 14 and 20

ft. Accurate set works positive

dogs. Hand or power feed. Runs on low

power—many owners use old auto engine.

Pays for itself quickly—thousands in commercial

service, everywhere. Write for free lumber handbook

and catalog of mills, supplies, tools, saw tables, and

woodworking equipment.

Belsaw Machinery Co., 848-1 Davidson Bldg., Kansas City, Mo.

**FARM
MODEL
\$49.00**

This Christmas give
Hearing Ease
to someone now
HARD OF HEARING



... with
**Western Electric
HEARING AID**
Ortho-technic Model

IF one of your parents, relatives, or friends is handicapped by poor hearing, think what it would mean to hear clearly again in group conversations, at theatres, movies, concerts—to join once more in the "small talk" that adds so much fun to living!

What more wonderful gift could you give them than better hearing?

How you can do it

Naturally you cannot select a hearing aid for another person any more than you could select glasses for them. But you can either give them a letter-of-credit on their nearest Audiphone dealer, or take them there for a scientific Audiometric test.

Then the new Western Electric Audiphone can be assembled to meet their individual needs. Built on new principles in hearing aid design, this product of Bell Telephone makers is bringing greater happiness to many users.

Why not send the coupon today for further details and dealer's name?

GRAYBAR ELECTRIC CO., Graybar Bldg., New York.

Please send details on New Western Electric Audiphone (Ortho-technic Model) and name of nearest dealer.

PS-39

Name _____

Address _____

City _____ State _____

New BOOKLET
ON MICROSCOPY
Free!



THOUSANDS have found in microscopy a fascinating personal home hobby. A new 20-page booklet tells what to look for through a microscope, how to begin your exploration into the mystic unseen world. Write for your free copy today.

At left, precision Bausch & Lomb Model R Microscope, 75 to 300 power, with 455-page book. \$21. Book alone, \$5.00. Other microscopes, \$14.50 to \$774.50.

BAUSCH & LOMB
227 BAUSCH ST., ROCHESTER, N. Y.

BAUSCH & LOMB
MICROSCOPES

America's Smallest Radio
...WITH BIG SET FEATURES



A real radio in every respect. Small enough to carry in one hand (6 1/2" x 5" x 4 1/4") yet powerful enough to bring in stations near and strong. Dynamic speaker. Complete with 4 full size GENUINE RCA tubes and aerial—ready to play on any 110 volt, 60 cycle current. One year guarantee. **Free Home Trial.**

\$6.94 in Walnut

IVORY...Sixtra
Money Back Offer!
Rush \$1 deposit
Balance C. O. D.

1933 CATALOG FREE
Silver Mfg. Co., Inc., Dept. 32, 2868 Elston, Chicago

NEW FOR HOME SHOPS

DUTCH KRAFT
WOOD FINISHING KITS



Now, for the first time, you can have for your home shop the same wood finishes used by the leading furniture factories in Grand Rapids and throughout the country. Dutch Kraft Wood Finishing Kits give you complete assortments of necessary quality materials, especially prepared and assembled by leading experts for fine wood finishing. You can do better work and you save money, because these kits save you from \$1.65 to \$7.64. Send trial order today for Kit No. 1, containing 20 finishing items—stains, thinner, varnish, shellac, filler, wax, sandpaper, brushes, etc.—regular \$4.15 value for only \$2.50 plus postage. Weight 12 pounds.

THIS VALUABLE MANUAL SENT TO YOU FREE



Considered the most practical and helpful guide on wood finishing ever prepared, this Dutch Kraft Manual, containing helpful hints and practical suggestions for your wood finishing sent **FREE** on request. Write for your free copy today. Send check for Kit No. 1.

DUTCH KRAFT CORPORATION
Subsidiary of Grand Rapids Varnish Corporation
Main Office and Factories: Grand Rapids, Mich.

Make a Mechanical Stage for Your Microscope

(Continued from page 217)

a curve at the extreme end to fit around the two rear buttons of the shorter micrometer unit. Solder the buttons to the bracket as shown, being sure that the micrometer screw is directly above the unthreaded rod of the unit, and that the entire unit is parallel with the edge of the microscope stage.

Finally, unite the upper micrometer unit carrying the slide holder with the threaded buttons of the lower micrometer unit. These buttons, incidentally, are only $\frac{1}{2}$ " apart, measured between outer surfaces. A heavy brass link, made from a piece of $\frac{3}{32}$ " by $\frac{1}{4}$ " stock, or something similarly stiff, joins the two micrometer units. One end of this link is soldered to the knob end of the unthreaded rod of the crosswise unit, while the other end is soldered to the tops of the two threaded buttons of the second micrometer unit. The link must, of course, be bent to fit properly, and the two units must be held in position with clamps or other means while the soldering is being done. A small torch is better for soldering than an iron, in this case. When assembled, the lower micrometer unit, should be about $\frac{3}{4}$ " below the upper, crosswise unit, to allow sufficient clearance for the end of the slide carrier when it is in an extreme right-hand position.

That just about completes your mechanical stage. No finishing of the brass is required, unless you want to lacquer it to get rid of the brassy color. Ease of operation depends on proper alignment of the various parts, and adequate clearance without introducing lost motion. A bit of oil may help things in case of a little binding.

Dimensions are not of extreme importance, and you can vary those given within reasonable limits. If you are left-handed, you can transpose the parts so that the control knobs are on the left. In the stages shown, lateral travel of the slide carrier is about $3\frac{1}{2}$ " maximum, which is more than would be required; but much of this results from allowing space at the right sufficient to permit the stage to be mounted to a larger microscope. The spring clips permit the slide to be shifted endwise if necessary, to bring the object area over the opening. Travel of the slide carrier forward and back is slightly more than 1" overall.

With your mechanical stage completed and attached to your microscope, a little practice will make you familiar with its use. In the ability to move specimens accurately under the lens, you will gain new precision and enjoy greater thrills with your hobby.

**REAL THRILLS
IN MICROSCOPY**

.....EASY
INEXPENSIVE
HOBBY.....

**WELCOME
CHRISTMAS
GIFT!**

NATURE'S hidden miracles clearly revealed through this Wollensak microscope—only microscope with 425 power for \$20. Magnifies from 100 to 425 diameters, in steps of 25. Easy to use. Ideal for photomicrography. Also 425 150-power at \$14.50—magnifies from 70X to FREE 150X. At stores or BOOK! direct, postpaid (or C.O.D.). Money-back guarantee. Send for **\$20 FREE Book!**



Wollensak Optical Co., 800 Hudson Avenue, Rochester, N. Y.

WOLLENSAK

NEW POLAROID PRODUCTS

Polaroid Desk Lamp \$16.50

A light without glare. Money back guarantee.

Polaroid Jr. Microscope Attachment \$3.50

Converts any microscope into a polarizing unit.

See October Popular Science Page 200 for other uses.

Polaroid Sun Glasses To eliminate Glare \$3.75

Polaroid Film Can be cut for experimental needs.

4"x4"—\$4.00; 12"x12"—\$25.00.

Order direct from
POLARIZING INSTRUMENT CO.
8-10 W. 40th St. N. Y. City

60 POWER TELESCOPE... \$219

VARIABLE EYEPIECE 20X—40X—60X

NEW! Three telescopes in one. 3 different magnifications.

20 power for ultra-bright images with 40 and 60 power for

extra long range. Guaranteed to bring distant objects,

people, sports events, ships, moon, stars,


etc., 60 times as close.

Most powerful made for anywhere near the money. Closes to less than a foot in length. Multiple lens system, 80 mm. objective lens, 6

sections. Directions included for using as a compound 4 lens microscope. American made. We pay the postage. Only \$2.19. Catalog of Microscopes, Binoculars, etc. FREE on request.

BROWSCOPE CO., Dept. 612, 5 W. 27th St., New York, N. Y.

**A Gift in the
Right Direction**



Everyone on your gift list will receive lasting enjoyment and practical use from a Hull Streamline Auto Compass—directions of travel are never a problem. Streamlined Bakelite case, built-in compensator, genuine sapphire bearing. Follow this excellent gift suggestion—only \$2.96 at your dealer. Attractive holiday package. Write for circular.

Hull Mfg. Co., P.O. Box 246-E8, Warren, Ohio

Radio-Electrical EXPERIMENT KIT

25 UNITS genuine salvage commercial apparatus with fine experimental manual! BUILT Radio circuits, 110-volt AC motor, eaves-dropping phone, thief detector, powerful arc light, ultra-violet rays, arc furnace, scores more! Used world-wide! Learn at home!

SEND ONLY \$3.99 for Special DeLuxe Kit and 6 FREE fine Electrical Radio books. Books alone worth \$3.00! Sent C. O. D. if desired. Stamp brings Bargain Catalog!

ELECTRICAL SALVAGE CO. Box 524-S12 Lincoln, Neb.

Only \$3.99 6 Books FREE



AMERICA'S MODEL SHIPYARD BUILD Boucher MODELS

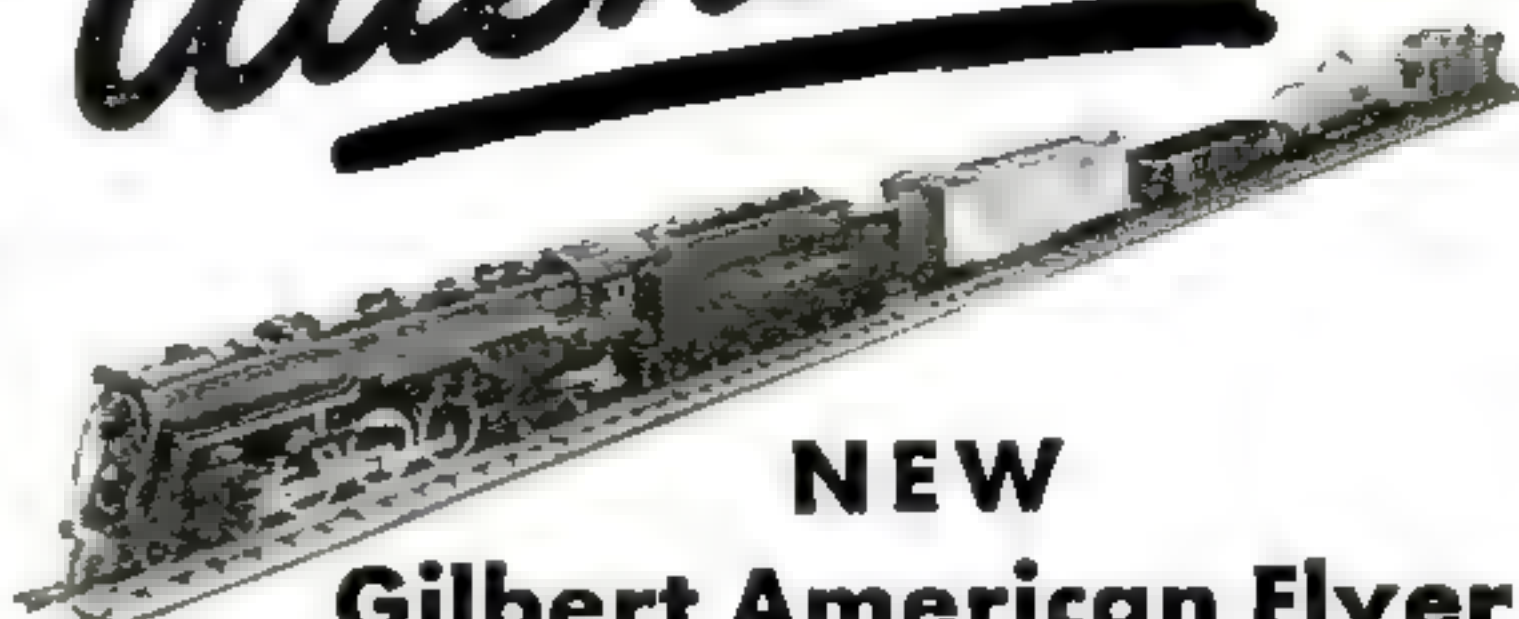
BOUCHER SHIP MODEL KITS for Beginners. Complete from \$5.00 to \$9.50. FREE LEAFLET P-12. Send 25c for Fully Illustrated Books.

BOUCHER 126 LAFAYETTE STREET NEW YORK EST. 1905



"HO" GAUGE MEN

Attention!



**NEW
Gilbert American Flyer
scale model is here!**

The A. C. Gilbert Company, manufacturers of Gilbert American Flyer trains, present a new "HO" gauge two-rail train line. Built to scale from actual railroad blueprints. All rolling stock is die-cast, with bakelite wheels. All couplings are automatic. Locomotive is 4-6-4 N.Y.C. Hudson type, with remote-control reverse motor. 25-to-1 reduction gear gives tremendous pulling power. Locomotive and tender weight, 3 lbs.; freight cars and caboose, 1/2 lb. each.

AND LOOK AT THE LOW PRICES!

Complete train, consisting of locomotive, tender, 3 freight cars, caboose and 16 sections of curved track (a complete 24-inch radius circle)....\$19.50

Train—in kit form, completely machined, to be assembled and painted.....\$15

Locomotive and tender complete.....\$12.50

Same—kit form, to be assembled and painted...\$10

Freight cars and caboose (each) complete.....\$2

Same—kit form, to be assembled and painted, \$1.75

Write today for free catalog illustrating and describing these remarkable new trains, as well as newly designed "O" gauge Gilbert American Flyer trains and equipment.

**BIG NEWS
FOR "O" GAUGE MEN**



Gilbert American Flyer now offers a brand-new "O" gauge six-wheel switcher. An exact scale model. Remote control. Automatic couplers. Slope-back die-cast tender with rear headlight. Read full description in free catalog. Price, \$12.50.

**GILBERT
American Flyer Trains**

MADE BY THE A. C. GILBERT COMPANY
506 Erector Square New Haven, Connecticut

Please mention POPULAR SCIENCE when writing to advertisers.



... here comes a

**Flexible
Flyer**

They will have to get out of the way when you come down the hill with one of these new streamlined Flexible Flyers.

They sail along like nobody's business, ride bumps like a new car, sweep around curves like a racer. They're the smoothest, speediest, safest sleds ever made... just what you want for Christmas!

Tell Dad and Mother about Super-Steering, with a turning range double that of other sleds. It gives you full control at all times. Tell them about the new Safety-Runners, with no sharp ends to cut you.

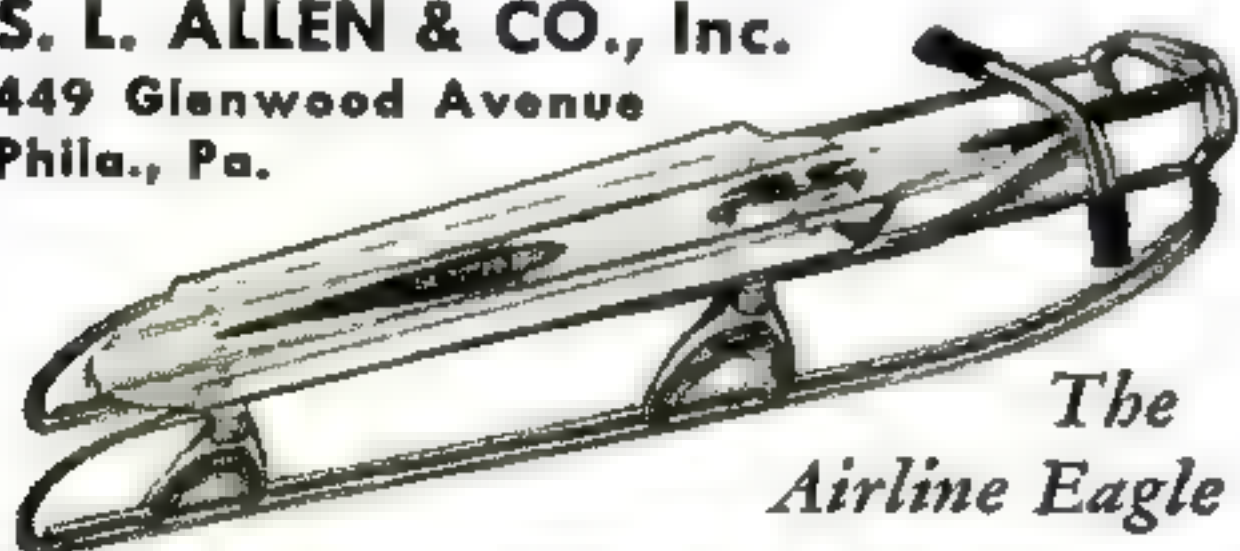
Take Dad to the store and show him the smooth Airline Eagle. He'll understand why Flexible Flyer is still the favorite sled of red-blooded boys and girls—just as it was when he whizzed down the hills.

Show it to the folks and tell them why you want this streamlined beauty for Christmas. You'll be the king of the snow trails this year!

Write for **FREE** cut-out model of the Airline Eagle. It steers just like a real sled.

S. L. ALLEN & CO., Inc.

449 Glenwood Avenue
Phila., Pa.



*The
Airline Eagle*

**Flexible
Flyer**

Table-Top Factories

(Continued from page 211)

known as "aluminum-soap greases" actually are made in just the way you used.

Casting duplicates of small objects in synthetic resin offers one of the greatest thrills that await an amateur chemist. You can repeat a chemical feat that made history, by preparing and molding the resin almost exactly as the pioneer in the field of plastics, Dr. Leo H. Baekeland, did it some thirty years ago. For the experiment you will need a supply of formaldehyde solution of about thirty-seven-percent strength, the usual type sold; and of phenol, or carbolic acid, in its pure, solid form—not the solution which is used as an antiseptic. Like such common household substances as iodine, lye, and ammonia, phenol is a poison, but may be handled perfectly safely with reasonable care.

Immerse a bottle of phenol in hot water to melt the contents. The crystals liquefy above forty-three degrees centigrade (109 degrees Fahrenheit). When they have done so, weigh out 100 grams of the liquid phenol in a beaker of about 300-cubic-centimeter capacity. Add fifty cubic centimeters of the formaldehyde solution; then a gram of sodium hydroxide or potassium hydroxide, which has been dissolved in about three cubic centimeters of water, to serve as a catalyst, promoting the reaction. The rest of the experiment must be performed outdoors, unless your laboratory has a hood that can be used for drawing off the formaldehyde fumes, as they cannot be tolerated in a room.

Heat the brownish liquid in the beaker to a gentle boil. Keep it at this temperature until, after about twenty minutes, the entire contents becomes thick like cold molasses. You will have no trouble in judging this point, as you will notice the sluggishness with which bubbles break through the hot liquid. This is the time to pour it into molds.

You can use a test tube or a small bottle as a mold, or you can make small plaster-of-Paris molds of more elaborate shapes. These should be prepared in advance by pressing small objects such as a radio knob or the head of a small doll into the wet plaster, and allowing the plaster to harden.

After you have poured the resin into the molds, the castings must be "aged" or heat-treated. The purpose of this treatment is to make them firm, infusible, and insoluble. Place the filled molds in a closed box that will serve as an oven. The drying oven described in a previous article in this series (P.S.M., Oct. '38, p. 206) is well-suited for this part of the experiment, when a lamp of

(Continued on page 250)

OWN A ROYAL



Believes Royal helped him get ahead!

"The day I got my Royal I started typing my reports. The boss liked it. Soon I had a larger territory. Now I have 5 men under me."

PORTABLE ON



Glad they picked a Royal

"All of us use our Royal Portable—Junior for his homework—I to work out assignments for a correspondence course which I'm taking."

YOUR OWN TERMS



Ideas typed on Royal bring raise

"Ideas count where I work. Since I got my Royal, I've typed mine out. Already I've had one raise, and I expect another."

Only a Few Cents a Day

FREE HOME TRIAL FOR EVERY

MEMBER OF THE FAMILY! A Royal Portable will help you write faster, think faster. A practical, modern necessity—it's an opportunity for a better, brighter future! A chance to do more, *be more!*

Without risking a penny prove—right in your own home—that a Royal will help you—whatever your business or profession—help you to set down your ideas and reports *legibly, impressively*. Prove too, that it will help the children with their homework . . . *help every member of your family with their writing!*

READ WHAT ROYAL GIVES YOU! Standard, full-sized keyboard. Easy, effortless action. Touch Control, Finger Comfort Keys, Genuine Dust Protection, Automatic Paper Lock, Touch-set Tabulator and many other office typewriter features. Tested, proved, guaranteed!

FREE! Royal's Instant Typing Chart, shows you how to type **RIGHT, INCLUDED** with every Royal Portable at no extra cost—a handsome, all-weather, triple-convertible Carrying Case.

SEE what a Royal will do! Then own it on your own terms—cash or *only a few cents a day!* Mail coupon today for full details of Royal's offer—prices, terms, Free Home Trial—everything. No obligation.



ROYAL TYPEWRITER COMPANY, Inc.
Dept. C-94, 2 Park Ave., New York, N. Y.

Tell me how I can own—for only a few cents a day—a latest model Royal Portable—with **FREE HOME TRIAL**.

(DO YOU OWN A TYPEWRITER NOW? Then make it help pay! Write Make and Serial No. on coupon margin for full trade-in value.)

NAME _____ STREET _____
CITY _____ STATE _____

NOW! Anyone without experience can do a thousand and one **REPAIR JOBS!**

WELDING

BRAZING SOLDERING

QUICKLY
PERFECTLY
EASILY

with
the

NEWLY
INVENTED

3 IN 1

Electric TORCH

Complete with Power Unit—Works Off 110 Volt AC or DC Light Circuit



Here at last is a portable machine that does real welding, brazing and soldering, yet is priced within the reach of all. The 3 in 1 comes to you complete with goggles, carbons, various types of welding rod and all accessories needed to do various repair jobs. It is all ready to plug in a light socket—nothing extra to buy. Simple instructions make it possible for you to do first class work easily without any previous experience or mechanical skill. The 3 in 1 instantly creates a terrific flame by just touching the carbons together.

REPAIRS FENDERS, AUTO BODIES, TANKS, BICYCLES, RADIOS, ETC.

The 3 in 1 is ideal for auto body repairs and fender weld jobs and steam fitters, plumbers, sheet metal shops, engineers, maintenance men and janitors will find it indispensable. By following simple instructions, heavy work such as bumpers, tanks and industrial repairs can be done. Ideal for the countless jobs around a home or farm. **WORKS ON ALUMINUM, BRASS, COPPER, IRON, STEEL AND OTHER METALS.**

AGENTS! You will find quick easy sales waiting for you in repair shops, garages, factories, sheet metal, radio and bicycle repair shops, and many other places. Write at once for free particulars and learn how you can get your own 3 in 1 Electric Torch absolutely free for demonstration purposes by helping to introduce it to others.

ELECTRO-TORCH CO., 2613-BN Michigan Ave., Chicago, Ill.

KAYWOODIE

\$3⁵⁰



You'll be telling friends

It's an affable habit, smoking a pipe. Uncommonly affable, indeed, if you smoke a Kaywoodie, because Kaywoodie is such an uncommonly sweet pipe. Making that kind of pipe has been the business, and pleasure, of the Kaywoodie Company for years, and so you might say Kaywoodie is something of a benefactor. If you are still without one, take our well-meant advice: buy one. After that, it will be you telling your friends that sells the next Kaywoodies. Maybe you'll even tell us it's the best pipe you ever owned.

Shape pictured No. 14, called curved. 7/8 Actual Size. For a better view of this beautiful pipe, turn the magazine sideways



This shows the "prime cut" section of a large, mature briar burl—the only part that contains briar of possible Kaywoodie quality.

Yours for the asking: Pipe-Smoker's Almanac . . . interesting things about pipes.

KAYWOODIE COMPANY
Rockefeller Center, NEW YORK and LONDON

Table-Top Factories

(Continued from page 248)

from sixty to 100 watts is placed within it as a source of heat. Heat the castings for four hours at a temperature of about sixty degrees centigrade, or 140 degrees Fahrenheit; and then for four hours or more at about seventy degrees centigrade, or 160 degrees Fahrenheit. When this has been done and you remove the castings from the mold, they will be transparent and tinted the color of sherry wine.

If you age the castings for the minimum time specified, they will still yield somewhat under heavy pressure, but should retain their form for some months at least. They will be more durable if you continue the heat treatment for several days; and even a week is not too long.

Some variations in this method—which, like those that follow, is to be regarded purely as experimental and not intended to produce practical or salable castings—are introduced in commercial practice. After the hot, viscous liquid has cooled, it is ground and mixed with a filler. Then, with the aid of heat and pressure, it is molded into pipe stems, radio parts, handles, and knobs.

Another modern commercial product is a varnish made from synthetic resin. You yourself can demonstrate the way that such a varnish is prepared by dissolving in acetone some of the resin that remained in the beaker.

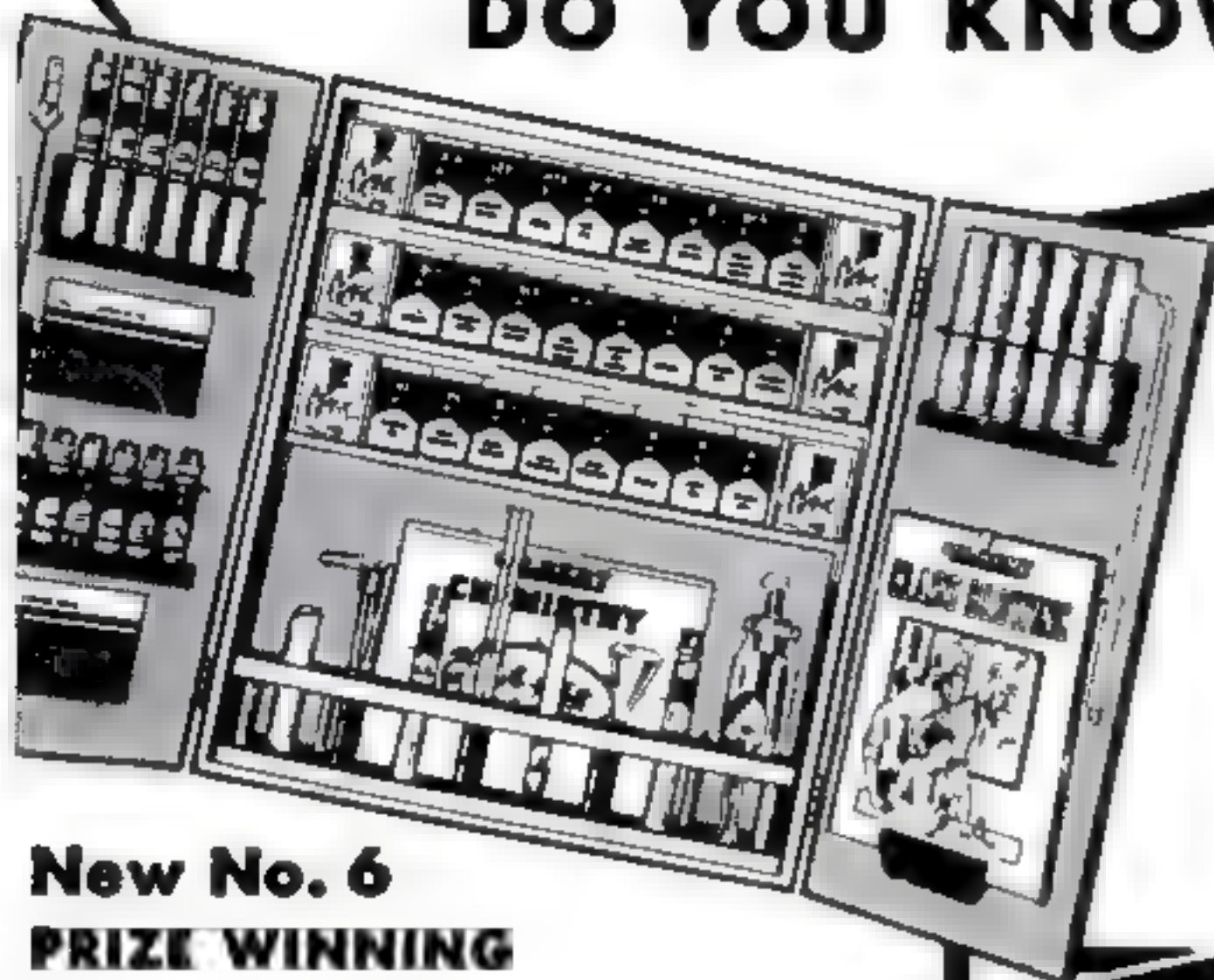
To clean the beaker after these experiments, immerse it completely in a tin can filled with a solution of sodium hydroxide (lye), and boil the solution.

A second type of synthetic resin can be made indoors. Heat sixty grams of pure ethylene glycol and 150 grams of phthalic acid anhydride in a flask that is fitted with a condenser. A thermometer should be placed so that its bulb dips into the contents of the flask. At a temperature of about 188 degrees centigrade, or 370 degrees Fahrenheit, the mixture will liquefy completely. As you continue heating, water distills over, and should be discarded. When the temperature reaches about 210 degrees centigrade or 410 degrees Fahrenheit, the hot, stiff liquid in the flask—now a synthetic resin—is ready to be poured into molds. Like the other type of synthetic resin, this one should be "cured" or aged in an oven to make it infusible and insoluble, and the same details of the treatment apply in this case. The transparent castings made from this resin will be clearer than wax.

Uncured resin left in the flask may be dissolved in acetone or other solvents to make

(Continued on page 252)

Boys! HOW MANY OF THESE CHEMICAL SECRETS DO YOU KNOW?



New No. 6 PRIZE WINNING CHEMISTRY LABORATORY

Big blue wooden cabinet forms Laboratory over 2 ft. long with 5 feet of test tube racks and shelf room. 63 chemicals and pieces of apparatus, including glass blowing equipment, 2 books by noted Yale professors describing over 400 exciting experiments. Price \$5.00. Other Gilbert Chemistry Sets \$1.00 to \$15.00. See them at your nearest toy store.



Do you know the secret of writing messages in magic ink, of making a chemical weather flag, changing the colors of flowers, making your own paints, sparklers, soda water? All these and many other thrills can be yours with a Gilbert Chemistry Set—the set that has been developed in the Gilbert Hall of Science. Also—the new Gilbert Microscope reveals to you Nature's innermost secrets.

\$200.00 Annual Awards—To the boy doing what, in the opinion of Mr. A. C. Gilbert, is the most important research in Chemistry, Microscopy or Electricity in 1939, \$100.00 in cash will be awarded. To the ten boys doing the next most important research, \$10.00 each will be awarded. Mail coupon below for free 20-page book giving full details.

Free BIG BOOK "FUN WITH GILBERT TOYS"

20 pages crammed with color pictures of new Gilbert Chemistry Sets and latest developments of Gilbert Hall of Science. Mail coupon or 1c post card.

THE A. C. GILBERT CO., Gilbert Hall of Science, Room 108, New Haven, Conn.

Name.....
Street.....
City..... State.....

THE AUTOMATIC HAND THAT REACHES OUT—



PULLS DOORS SHUT (EVEN WARPED DOORS)

NEW Clever AUTOMATIC INSIDE LATCH for CABINET DOORS that won't stay shut
Nothing like it!

Larger sizes for cupboard or closet doors and casement windows.
Easily installed. Replace old balky fittings now!

WIN-DOR

Snugger

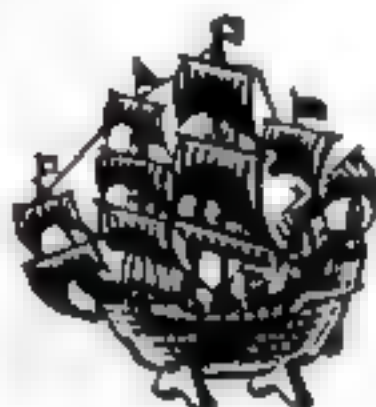
fittings now!



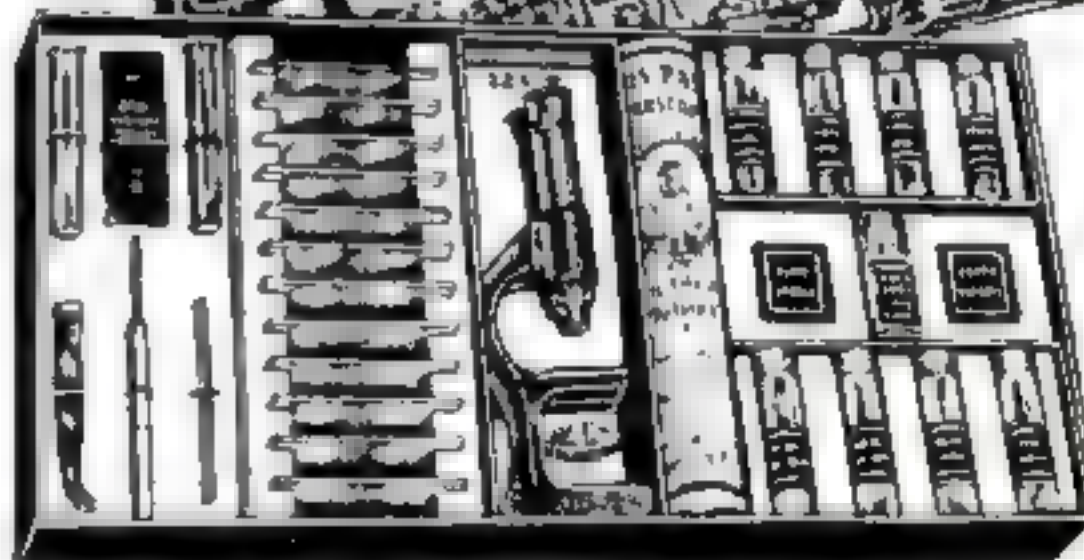
THE CASEMENT HARDWARE COMPANY
400-G North Wood St. Chicago

AT YOUR HARDWARE STORE

SHIP MODEL MAKING



New book shows how to make any model. Shows the short cuts, kinks, time-saving methods of experts. Complete plans for gorgeous galleon, clipper ship, etc. Almost 100 illustrations. Full cloth bound \$1.00. Popular Science Monthly, Dept. 128, 353 Fourth Ave., New York.



A most useful and fascinating gift for any boy and girl. Equipped with 125 power microscope. In addition to the valuable education you can obtain from this set, the instruction book also contains an interesting resume of Louis Pasteur's life and shows how important a microscope was to his work.

Send \$2.50 check or money order direct to us, if your dealer cannot supply you.

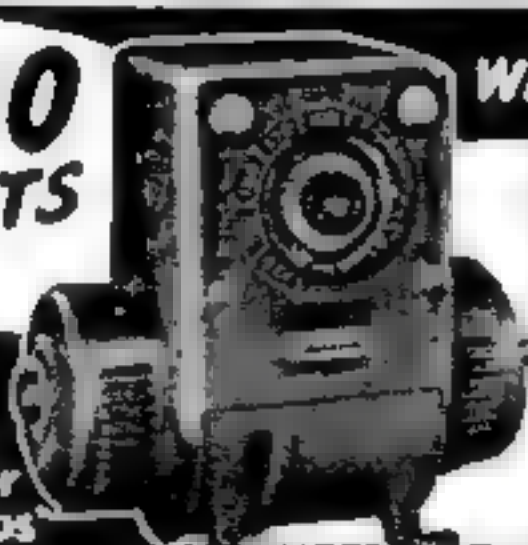
Manufactured by the makers of the famous "Microscopes." Send for free booklet.

CAROLYN MANUFACTURING CO., INC.
50 East 11th Street New York, N. Y.

You'll Earn
\$150 TO \$300
EXTRA PROFITS
MONTHLY

FREE

FREE BOOK
on Profits for
Welding Shops



with 40 VOLT "Simplified" ARC WELDING

"BUILD YOUR OWN"
SAVE \$300 TO \$500

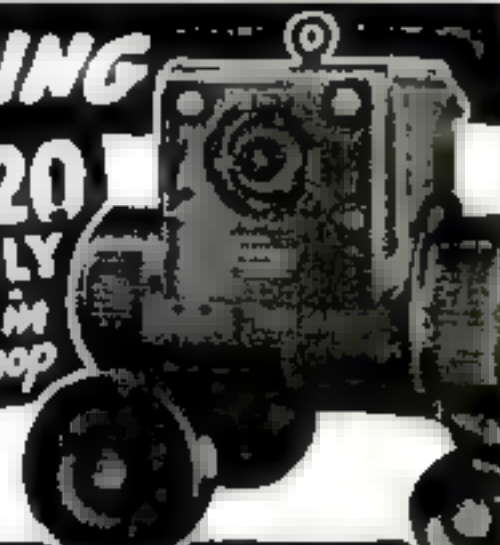
Use your own engine and chassis with this unit, get advantages of portable welder that lets you go to the big pay jobs.

Start big paying business of your own now, with new 40 Volt Simplified Arc Welder. Faster, simpler, easier to operate. Economical for commercial use... extra profits pay for it without expense to you.

30 DAYS TRIAL! on your own work, at our risk, to prove it's profitable. Write today to

HOBART BROS., Box P-128 THOY, D.

ONLY \$20
MONTHLY
Pays it in
your shop



*A Remington Portable
—the Gift Your Whole Family Shares—*

**It's easy to do
your Christmas Shopping**

Just drop in on your nearest Remington dealer for five pleasant demonstration minutes. Or simply 'phone him and he comes to your home *at your convenience*. Or—clip the coupon and get the information by mail. You shop in your own home. **AND WHAT A GIFT IT IS!** Your whole family is bound closer together by something each can use. Even those in far away places will be nearer because you'll write more often.

Remette

\$29⁷⁵

INCLUDING
CASE



Why
your family
needs a
REMINGTON

Children—Win higher school marks—have shorter home work hours—develop self-expression... greater confidence—are stimulated to new ideas with this educational tool.

Parents—Keep up with social and other correspondence easily—keep valuable family papers legibly.

**FOR THE FIRST TIME AT
SUCH A LOW PRICE...**

A real Remington—a gift you'll be proud to give your family. For so little money you now get a complete, 84 character, four-row standard keyboard machine.



**Remington
Deluxe
Noiseless
Portable**

Everyone is amazed at the silent speed of this marvelous Noiseless Portable. You can work while others sleep—or travel while you work, without the slightest disturbance to anyone. It's easy to give a Remington this Xmas. (8 models to choose from.) You can pay as little as 10¢ a day.

Remington Rand Inc., Buffalo, N. Y. Dept. 153-12
Tell me, without obligation, how to get a new Remington Portable for as little as 10¢ a day. ☐ Send catalog.

Name.....
Address.....
City and State.....

Table-Top Factories

(Continued from page 250)

an experimental varnish. You can clean the flask of any viscous residue that remains by heating in it a mixture of equal parts of sulphuric acid and water, together with some potassium dichromate or sodium dichromate.

With the set-up just described, you can make still another resin—this time, a black one resembling tar. Heat in the flask 250 grams of phenol, 175 grams of ordinary thick glycerine, and five cubic centimeters of strong sulphuric acid, keeping the temperature between 160 degrees and 190 degrees centigrade (or 320 degrees and 375 degrees Fahrenheit). Water and liquid phenol will collect in the receiver of the condenser. From time to time, pour back the lower layer of liquid phenol from the receiver into the reaction flask. When about fifty cubic centimeters of water have been distilled over, cool the flask slightly. Stir in about five grams of precipitated chalk or calcium carbonate to neutralize the acid. Then pour the contents of the flask, while still warm and fluid, into molds and carry out the curing or heat treatment as with the other types of resin.

Latest Refining Process Gets Gasoline from Gas

USING only gases from oil wells and refineries, a new gasoline-refining process just developed by an American oil firm promises to increase the yield of crude-oil supplies by 150 percent, it has been announced. At the same time, the method would reduce the nation's crude-oil consumption by 625,000,000 barrels a year, while a better gasoline product would be turned out.

POPULAR SCIENCE Question Bee

HERE are the answers to the Question Bee on page 152. See what score you made by checking your answers against the table below. Allow yourself five points for each of the questions answered correctly, the letter beside each number being your check for this. A score of from 75 to 85 is good; if you made from 90 up, *you're good!*

1. b	5. a	9. b	13. c	17. b
2. c	6. b	10. c	14. a	18. c
3. c	7. c	11. a	15. d	19. b
4. c	8. b	12. d	16. b	20. b

At Last—FINER SANDING in Hours LESS TIME!



Use it for . . .
SANDING
GRINDING
SHARPENING
POLISHING
BUFFING
REMOVING PAINTS,
VARNISHES

New Guild PORTABLE ELECTRIC Sander

Just what you have been waiting for—a portable, high-precision power sander at a price you can afford. It saves time and toil on all your sanding jobs. Equals the quality of work done by sanders costing twice as much.

Straight-stroke, continuous sandpaper belt works with the grain—leaves no cross-grain marks or swirls. Handles wide variety of outside and inside curved surfaces . . . and all plain surfaces.

OUR TRIAL OFFER

will let you see for yourself the many jobs you can actually do with this tool. Write for details today.

Works on wood, metal, bone, compositions, plastics. Weighs only 9 lbs. Plugs into nearest light socket. Anyone can use it. Fully guaranteed.

Syracuse Guild Tool Company
1700-12B No. Saline St.
Syracuse, N. Y.

GRANDFATHER'S CLOCK, LOWER PRICED

Our newest offering, at an unheard of price for a faithful reproduction of a real Grandfather's Clock. Scroll top, narrow waist, like picture. Shipped Knock Down. Cleverly designed. Easy to assemble. Others even cheaper. Plans 10c, Catalogue FREE.
AMERICAN CHIME CLOCK CO.
1641 Ruffner St. (Established 1877) Philadelphia, Pa.



RADIO
JOKES
CURIOS
ANIMALS
BOOKS
MAGIC
RINGS
SEEDS

6000
AMAZING
NOVELTIES,
SCIENTIFIC
ARTICLES,
ETC.

Rush 3c for our gigantic catalog of 6000 unusual and amazing novelties, cameras, radios, electrical articles, live animals, joke goods, books, magic, seeds, punchboards, stamps, rifles, watches, etc., etc. Deluxe Cloth bound catalog, 25c.
Johnson Smith & Company, Dept. 253, Detroit, Michigan

BIG MONEY BUILDING MEAD'S New Portable OUTBOARD BOAT



IN A FEW DAYS AT HOME!

Build this light, 50 lb. tough, durable, seaworthy, portable Outboard Ki-Yak! Take it anywhere by hand or car. Safe, leakproof, trouble-free. More speed per horsepower, more miles per gallon. MEAD'S perfected aluminum-ribbed, cut-to-fit Construction Kit guarantees successful assembly, quickly, easily, economically. New 69 lb. OK-4 uses extra sail, motors 10 h.p. or less. Also 8 "CK" paddle-sail models from 20 lbs. to 45 lbs., Rush dime for details, \$6 Gift Paddle Offer!

MEAD GLIDERS

15 S. Market St., Dept. D-128
CHICAGO, ILL., U. S. A.

NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER

WORKS OFF 110-Volt Light Socket. This marvelous Dynamic Power Welder does the work of much higher priced types. It is RETAIL easily portable. WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as \$5.00 on one hour repair job. Go into business—Open a Welding Shop Now. AGENTS—Make big profits selling to garages, factories, janitors and machine shops. WRITE for 10-Day Trial Offer. DYNAMIC WELDER COMPANY
2226-FU SILVERTON ROAD, CHICAGO, ILLINOIS



EASY MAKE YOUR OWN FURNITURE



THE GOOD ENGLISH CRAFTSMAN WAY!

How to make everything from bookends to bedsteads with simple tools clearly described in THE CARPENTRY BOOK by Charles H. Hayward, Associate Editor, "Woodworker" Magazine.

WORKING DIAGRAMS AND LISTS OF MATERIALS NEEDED FOR MAKING 100 FINE USEFUL ARTICLES

Superior English methods of mortise and tenon, dovetailing, dowsing, panelling, door-hanging, veneering, upholstery, wood finishing made easy. 336 pages, nearly 600 diagrams including unusual tables, chairs, lamps, clock cabinets, trays, book troughs, kitchen cabinets, nursery furniture, garden furniture, garage, etc., etc. Nothing like it in the U.S.!

SEND NO MONEY—EXAMINE IT 5 DAYS FREE!

Sent postpaid for 5 Days FREE EXAMINATION. Then return book or send \$2.50—10% discount for payment now (same return privilege).

D. VAN NOSTRAND CO., Dept. P.S.M.-12-38, 250-4th Ave., New York

LIMITED EDITION—MAIL THIS COUPON NOW!

D. Van Nostrand Co., Dept. P.S.M.-12-38, 250-4th Ave., New York
Send THE CARPENTRY BOOK postpaid on 5 Days FREE APPROVAL. I will either return it or send \$2.50 as full payment.

Name.....

Address.....

City..... State.....

(10% discount for cash—send only \$2.25—same return privilege)

HANDEE

TOOL OF 1001 USES

This Year Give HIM A HOBBY

Men and boys of all ages satisfy their inherent urge to make scores of useful articles with the famous Handee.

Grinds
Drills
Polishes
Engraves
Sharpens
Carves
Cleans
Sands
Cuts
Saws



A WHOLE TOOL SHOP IN YOUR HAND

This amazing tool and your choice of accessories do a multitude of jobs on all materials. Set up shop wherever there is an electric outlet. De Luxe Model weighs 12 oz. 25,000 r.p.m. \$18.50 Postpaid with 6 Accessories.

ULTRA DE LUXE SET

A treasure chest. De Luxe Model and 26 popular Accessories in metal case. This practical gift will be appreciated and used for years. \$25.00 postpaid. Project Book included.

STANDARD MODEL

20,000 r.p.m. Weighs 16 oz. \$10.75 Postpaid with 3 Accessories.

200 ACCESSORIES

Quality built. Largest assortment, one for every job. See at dealers or in catalog.

GET A DEMONSTRATION

at any store or order either model on 10-Days Money-Back Trial. Catalog Free.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. S, Chicago, Ill.

☐ Send Catalog ☐ De Luxe Model ☐ Ultra De Luxe Set ☐ Standard Model ☐ Send C.O.D. P.S. 12

Name.....

Address.....

Please mention POPULAR SCIENCE when writing to advertisers.

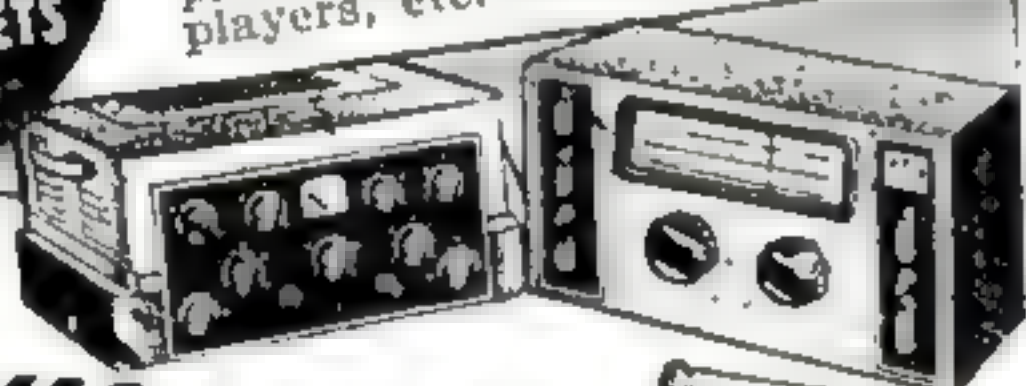
Save NOW..Profit NOW
ON EVERYTHING
IN RADIO
Lowest Prices..Buy NOW from
ALLIED'S 180 PAGE 1939 CATALOG!



1939
KNIGHT SETS
AT NEW
LOW PRICES

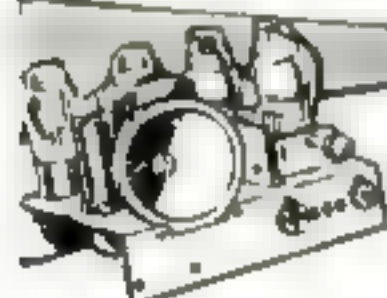
62 MODELS
NEW A.C. SETS
AC-DC MODELS
"TINY KNIGHTS"
NEW 1½ V. SETS

See the radio sensations of 1939—the new Knights—with new power, new beauty, new 1939 features—at new reduced prices. 62 models to choose from—as low as \$6.95—4-16 tubes, featuring the amazing new "Tiny Knights," new low-cost Push-Button Tuning drain battery sets (1.4 volt tubes), phono-radios, phonographs, record players, etc. Send for your copy!



SAVE MONEY ON
EVERYTHING IN RADIO

At Radio's Leading Supply House
 ALLIED's giant 1939 Catalog shows Everything in Radio—at 1939's lowest prices! Besides the famous Knight Radios, it includes over 14,000 parts for building and repairing, new Sound Systems from 8-65 watts, Amateur Transmitters and Receivers, latest Test Equipment, books, tools, accessories, and Radio's most complete line of recording equipment. It's Radio's Greatest Buying Guide!



FREE

BUILDERS' PARTS LISTS

As Radio Builders' Headquarters, we can supply matched kits for building any circuit described in any magazine construction article. Write for our Free Parts Lists. See pages 124-7 of ALLIED's Catalog for latest Popular Mechanics Kits; also, Beginner's 1, 2, and 3 Tubes; Auto Set; Photo Cell Kit; low-cost x-mitters, and over 100 diagrams and projects!

FAST, DEPENDABLE SHIPMENT

Our complete stocks, our central location, and our speedy shipping methods enable us to give you faster, more dependable shipment of all your orders. Order from ALLIED—you'll save time, trouble, and money!



SEND FOR FREE CATALOG

Allied Radio Corporation
 Dept. 7-M-9
 833 W. Jackson Blvd.
 Chicago, Ill.

☐ Send me your new Free 1939 Catalog

☐ Send Free Parts List for... ..

NAME

ADDRESS.....



MANY machine shops still use heavy machines to do small work when a bench outfit would be just the thing. Take a bench-type shaper, for instance: it sells for about the price of a medium-size electric refrigerator, and twenty cents would cover the power cost for ten hours.

Recently a machine-shop foreman told me that most of his men were better mechanics than he was. That's the reason he was holding his job—he knows how to pick 'em!

To mill a wide surface in an emergency, you can interlock two milling cutters of identical diameters by surface grinding a recess in the end of one and relieving the mating end of the other cutter to form a tang. Of course, both keyways must be kept in line.

The saving in material in only a few pieces of work will often cover the cost of a trepanning tool.

By arranging a cam on the cross slide of a lathe, it is possible to cut a taper thread with a regular die-head unit. The cam travels against the closing head, thus opening the head gradually at the desired rate.

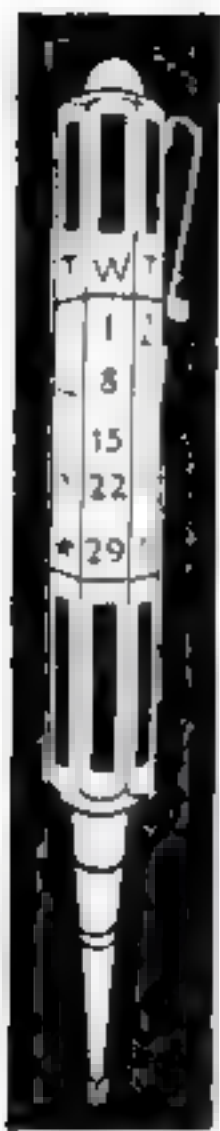
Since the price of a taper-shank end mill is about double that of a straight-shank tool, the so-called "positive grip" chucks pay for themselves quickly, and thereafter you save the difference in cost between the two types of tools.

For internal grinding, the diameter of the wheel should be between two thirds and four fifths that of the bore diameter. Too large a wheel will generate excess heat; if it is too small, it will wear down unnecessarily.

It is said that glycerin makes the best lubricant for drilling soft rubber.

Keep your eyes on any machine-tool bearing that heats 50 deg. above room temperature. Of course, it depends on the construction of the bearings and the quality of lubricant used. Some bearings are known to operate at a temperature of 350 deg. F.

A late development in steel is the addition of from 0.15 to 0.30 percent of lead. A special process distributes the lead so uniformly that all physical properties are retained, and the machinability is increased, it is claimed, from 30 to 60 percent.



Look! IT'S NEW mysto-pencil

Instantly opened or closed with press of thumb—and presto—
A Lifetime CALENDAR

that writes . . .
● Set it the first of each month and **MYSTO-PENCIL** will tell you the correct day and date.

● Gold or chrome colored with clip for man or with ring for woman.
ENCLOSE \$1.00 AND STATE COLOR AND KIND WANTED TO DEPT. 512

MYSTO-PENCIL SALES CO.
891-893 Golden Gate Avenue San Francisco, Calif.

SENSATIONAL OFFER 2 FENCING SWORDS FREE FENCING WORLD'S FINEST SPORT HARMLESS-EXCITING FUN



Develops strong body and alert mind. **HARMLESS.** These spring-steel 3-foot-long foils (swords) are equipped with rubber buttons. Aluminum cup-shaped hand guards. Our De Luxe foils are built for hard usage.

Complete set of two foils (swords) and free instruction booklet, only \$1.98. We pay postage. Two additional fencing swords **FREE** for limited time. (Regular price of these two sets of foils \$3.98.) **ORDER NOW.** All-American Fencers Guild, Dept. 12-SP, 48 W. 48th St., New York

Free PIPE CATALOG NEW! SAVES YOU MONEY



383 different pipes, 57 high grade tobaccos, pouches, racks, humidors, and pipe gadgets from all over the world at bargain prices! Tells—How To Keep Your Pipe Sweet, How To Blend, etc., etc. 48 pages . . . hundreds of illustrations! We ship **POSTPAID** all over U. S. Thousands of pipe smokers save money—We are the largest pipe purveyors and tobaccoists (strictly) in the world. Send for **FREE** Catalog now—No obligation.

WALLY FRANK LTD., 10 E. 45TH ST., NEW YORK DEPT. 209

A \$2.50 PRESS That PRINTS 18 Sq. In.

Ingenious Rotary Press. Furnished complete with sliding rubber type and equipment—at \$2.50. Prints pictures and several sizes of type. Fine for boys, small merchants, clubs, etc. Write **SUPERIOR TYPE, 3936 Ravenswood, Chicago.**



\$1.00 SAVE-GAS \$1.00

Yes it's true! Just \$1.00 buys a new and improved Gas Saver. If you aren't getting more than 18 or 20 miles to a gallon, and would like up to 40% better mileage, with increased power. Write to us at once. Agents Wanted.
BROXTON CO. P. O. Box 952 Beverly Hills, Calif.

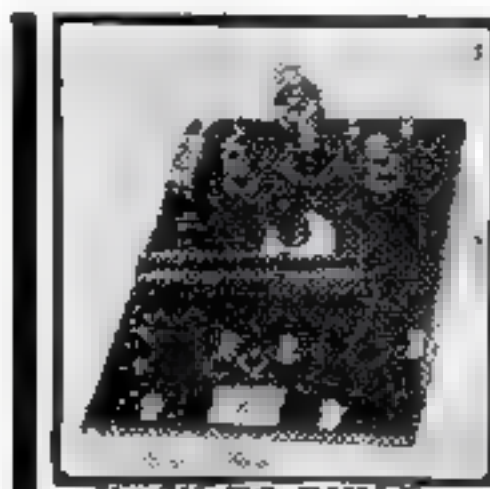
BUILD YOUR GRANDFATHER CLOCK

The Simple, Sensible Red-I-Kut way as thousands have. **DIME** brings PLANS and sixty picture "HOW" Book pricing many fine brass weight Westminster, tube chime, electric and battery movements showing nine beautiful colonial grandfather cases. **WHY WAIT LONGER?** Knappell Chime Clock Co., Clock Headquarters, Bldg. A-2, Guttenberg, Iowa



CUT ME OUT

Cut me out, paste me on a postcard and mail to Popular Science Monthly, Dept. 128, 353 Fourth Ave., New York, N. Y. I'll bring you complete supplies and instructions on how to make easily several dollars a week in your spare time.



AIR SCOUT JR.

A radio capable of keen broadcast reception. \$1 gives you complete parts, including tube, Panel, diagram and very simple instructions. This powerful radio uses inexpensive dry batteries. Send for your outfit today—Don't miss the fun.

\$1.00
WITH TUBE

EASY TO BUILD—
Allied Engineering Institute, Dept. PE-3, 38 Park Place, N.Y.

READY THIS MONTH NEW 1939 Atlas CATALOG



It's the biggest and most important Catalog Atlas has ever published . . . filled with new ideas for making your work with machine tools more interesting and profitable. Shows all the new Atlas 1939 developments and sensational machine tool values. You'll prize this book. Write for it now.

SEND THIS COUPON FOR YOUR COPY TODAY

ATLAS PRESS CO.

1255 N. Pitcher St., Kalamazoo, Mich.

Kindly send me your 1939 Catalog on: ☐ New Small Metal Lathe ☐ New 10" Metal Lathe ☐ New Metal Shaper ☐ Wood Lathes ☐ Arbor Presses ☐ Drill Presses

Name

Address

City and State



ATLAS PRESS CO.

1255 N. Pitcher St., Kalamazoo, Mich.

**LATHES · DRILL PRESSES
ARBOR PRESSES · SHAPERS**



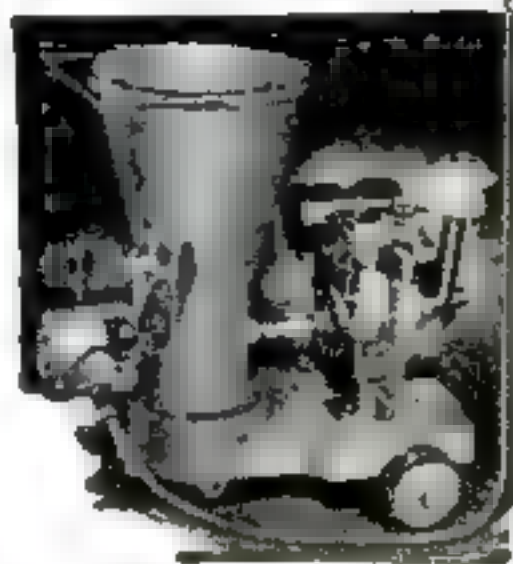
Make new or old buildings more attractive and waterproof. Plastic **COLORCRETE** fuses with any masonry surface. It fills all cracks. It can be sprayed in any thickness and in 30 colors. Fully proven by over twelve years actual use under all conditions and every climate.

Owners everywhere want to enhance values. With this machine you can supply this big waiting market with permanent **COLORCRETE** at amazingly low cost.

Offers big earnings. Operators report costs of 2c and up per sq. ft. and sell up to 7c. Some have paid for their equipment from first few jobs. Machine capacity up to 1,000 sq. ft. per hour.

Get the facts. **COLORCRETE** Books tell the whole story. Write today. It may mean business independence for you.

COLORCRETE INDUSTRIES, INC.
572 Ottawa Ave., Holland, Mich.



**COMPLETE RAILROADING
BY REMOTE CONTROL**

*Uncoupling!
Loading!
Unloading!*



BUT THAT'S NOT ALL...
YOU CAN MAKE YOUR LOCOMOTIVE
WHISTLE, REVERSE AND SWITCH
BY REMOTE CONTROL.

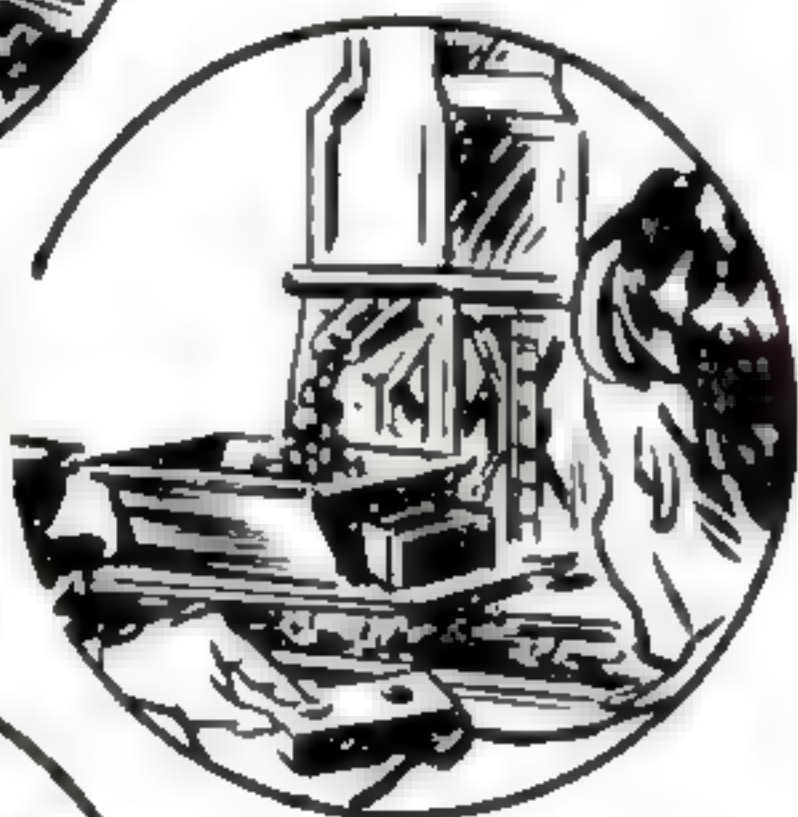


UNCOUPLING

Electro-magnetic couplers
on the cars are operated
BY REMOTE CONTROL.

LOADING

Car can be loaded
from coal elevator BY
REMOTE CONTROL.



UNLOADING

Car tilts, unloading con-
tents alongside track
BY REMOTE CONTROL.

Read all about these thrilling new operating
features in the new Lionel 52-page, full
color catalog. Send for your copy at once.

Insist on LIONEL
FOR ALL THE THRILLS OF RAILROADING

The Lionel Corporation Dept. JR
15 East 26th Street, New York, N. Y.
Enclosed is 10 cents for a copy of the new 1938, 52-page,
full color Lionel Catalog. Send it to:
Name _____
Address _____
City _____ State _____

Please mention POPULAR SCIENCE when writing to advertisers.

REALISM for Your Railroad



Freight Station \$2 Passenger Station \$1 Signal Tower 75c
True-to-life railroad and village buildings
in scale with 'O' gauge trains. Just what
every railroader (toy or scale model) wants.
Skyline Builder comes in kit form. Quick
and easy to assemble. Windows and doors
died-out. All parts cut to size. Made of
fibre-like Tensillite. Wealth of realistic de-
tail. Transparent window panes and sky-
lights. Walls and roofs printed scale size
to resemble brick, clapboard or shingle.
See these colorful buildings today. Sold by
model shops and department stores every-
where. Dept. N, The Schoenbut Manufac-
turing Co., 2056 Cas-
tor Ave., Phila., Pa.

NOTE LOW PRICES

Other Buildings

Residences (3 styles)	75c
Fire House	75c
Garage	75c
Church	\$1.50
School	\$1.50
Factory	\$2.00

If dealer can't supply
you send check or
money-order. We will
ship postage prepaid
to any point in U. S. A.

SKYLINE BUILDER

CHEMICALS

Laboratory Apparatus and Glassware

Send 3¢ for Catalog CP1

Dept. M25

BIOLOGICAL SUPPLY COMPANY

1176 Mt. Hope Ave.

Rochester, N. Y.

New 40 Page Catalog FREE!

**Laboratory Supplies
Apparatus-Chemicals
Scientific Books-Telescopes
Microscopes-Biological Needs**

Save Money! Buy direct. Send Now. It's FREE.
Full of Bargains & valuable information.

J. H. WINN MFG. CO., Dept. 112, 124 W. 23 St., N. Y.

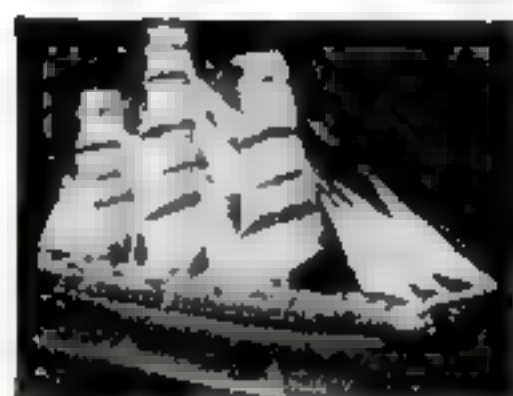


CUT ME OUT

Cut me out, paste me on a postcard and mail to Popular
Science Monthly, Dept. 128, 353 Fourth Ave., New York, N.
Y. I'll bring you complete supplies and instructions on how
to make easily several dollars a week in your spare time.

BUILD THE CUTTY SARK

2 PL. MODEL OF THE FAMOUS CLIPPER SHIP



Complete kit
makes perfect
building copy
2.50
plus 15¢
postage

Everything...including CARVED
WOOD HULLS, Printed-Scale
Decks, Cast-Metal Life-
boats, Anchors, Bitts, Steering
Wheel, Chains, Masts, Spars,
Rigging, Cement, Colored
Lacquer—Full-Size Plans and
Instructions.

Send for Catalog all Ideal's new Models. 10¢
IDEAL AIRPLANE & SUPPLY COMPANY, INC.
28 West 19th Street, New York



WORLD'S SMALLEST REAL PERFORMING RADIO

Midget radio fits your pocket or
purse. Complete in one unit -
weighs only 3 ozs., smaller than
cigarette package! Receives stations with clear natural
tone. NO CRYSTALS to adjust—NO UPKEEP—only one moving part. Self con-
tained "Speakophone" unit gives superior performance. IS NOT A TOY! THOU-
SANDS OF SATISFIED OWNERS—Many report amazing reception and distance.
Sent complete with instructions for use in homes, offices, hotels, boats, autos, in
bed, etc. TAKES ONLY A SECOND TO CONNECT. Receives FREE operating
power, by wireless, from radio stations.

SEND NO MONEY Pay postman only \$2.99 plus postage on arrival
or send \$2.99 (Check, M. O., Cash) and yours
will be sent postpaid. GUARANTEED. A most
unusual value. ORDER NOW!

TINYTONE RADIO CORP., Dept. PS-12, KEARNEY, NEBRASKA

CHEMICALS

5c C. P. Grade—Generous Quantities 5c
...and in glass containers—unconditionally guaranteed!

FREE big fully illustrated valuable catalog—a
real 25c handbook. Equip a complete home
or professional laboratory with chemicals,
apparatus, microscopes and instruments at real bargain prices.
Save money! Send 3c for postage. Get your copy NOW!

KENKIT SCIENTIFIC CORP.

397-A Bridge St. Brooklyn, New York

ELGIN KWIK SHAVE ELECTRIC SHAVER

\$1.99

No. E308 Compare with high priced electric shaver performance. Has self-sharpening cutter, precision head, vibrator type motor. Constructed so it should give a lifetime service. Operates on 110 AC.

(LOTS OF 2—\$1.39 EACH)

FREE: Wholesale catalog for salesmen, dealers, premium users. Shows over 4000 world wide bargains, many selling plans, numerous popular creations. Send for your copy today.

Spors Co. 10-38 Frank St. Le Center, Minn.



"Air Piloting— Manual of Flight Instruction"

by Virgil Simmons, formerly Flying Instructor at Boeing School of Aeronautics and in U. S. Army and Navy Air Services. 300 pages, 75 illustrations, \$3.00

This new book—just off the press—supplies a detailed system of instruction to prepare you for the official tests for a government certificate as an airplane pilot in any of the ratings, from solo to instrument, or as a flying instructor.

It completely analyzes all the flight test maneuvers required for the various certificates and special ratings. Diagrams show every detail, make correct performance easily understood. Common faults are described, their causes explained, methods for correction given. Book contains 377 questions taken from official examinations, with answers that have been accepted as correct.

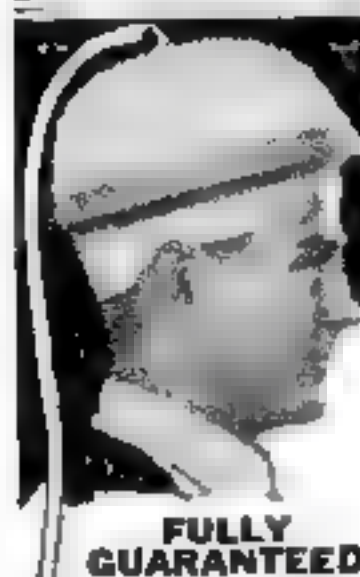
5 DAYS' TRIAL—SATISFACTION GUARANTEED: Send for this book with the privilege of five days' examination. When it reaches you, pay postman \$3.00 plus a few cents for delivery. If not delighted, send it back and your payment will be refunded at once. (If you remit \$3.00 cash with order, we will pay delivery charges; same return privilege.) Write today to

THE RONALD PRESS CO., Dept. M255, 15 E. 26th St., New York

ARE YOU "Unhandy"?

At last a service and repair manual has been made for the auto owner who is not a mechanic. Here are hundreds of "horse-sense" methods for keeping your own car in perfect shape—no matter how old or how new it is. **AUTO KINKS** tells in non-technical language, made clearer by drawings and simple diagrams, what to do no matter what goes wrong—how to make temporary or permanent repairs to the motor, carburetor, ignition, lights, starter, radiator, chassis, running gear, body, fenders, top, and even the garage. Will give you more understanding of the mysterious "insides" of a car than anything you ever saw. Service men will get a world of new ideas from it too. 192 pages, full strong cloth binding, pictures on every page. Only \$1.00. Sent C. O. D. plus few cents postage. Ask for "AUTO KINKS." Write to

Popular Science Monthly, Dept. 128 A
353-4th Ave. New York, N. Y.



AMAZING MACHINE GROWS HAIR

"Intermittent Vacuum" stimulates deep-lying scalp blood vessels—and GROWS HAIR in thousands of cases of baldness. Stops falling hair. Tones up scalp. New hair often in 90 days. Easy to use this amazing machine at home. Only \$9.95 complete. Write quick for FREE TRIAL OFFER.

Only
\$9.95
COMPLETE

RAND, DEPT. R-1639, NEWPORT, KY.

Duro HAND GRINDERS FOR GREATER VALUE

- POWER
- SPEED
- PRECISION



ONE WELL KNOWN TOOL AND DIE MANUFACTURER WRITES—

"Enclosed herewith find check for \$45.15 covering cost of three No. 3049 Hand Grinders plus postage.

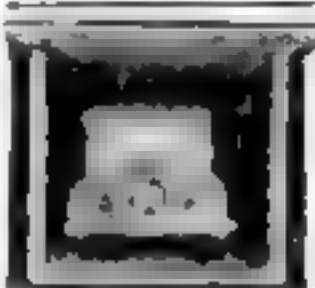
After thoroughly testing the one we purchased for trial purposes, my men have told me that it is the finest Grinder they have ever used, and we have tried them all. That it has plenty of power and speed and that it really stands up under hard work without stalling or getting hot.

My foreman told me that if he could not replace it, he would not sell it for \$100.00."

Our Standard Duty Grinder is the same value in its price field. Write for special circular on the Duro Hand Grinders and Accessories or let us send either model on 10-day money back trial.

SEND FOR NEW 1939
DURO WOOD WORKING
CATALOG...
Featuring
America's
Finest & most
Complete line

DURO METAL PRODUCTS CO.
2659 NORTH KILDARE AVE. DEPARTMENT H2
CHICAGO, ILLINOIS



OVERHEAD GARAGE DOORS

You can install this hardware on your old doors, or new ones. Door opens in one piece. Heavy steel springs do the work. Closes weather-tight. Needs 3" overhead room. Easily installed. Complete with instructions. Free circular. Agents wanted. R. W. WILKIE, Box 368, Independence, Mo.

Start a POTATO CHIP BUSINESS

IN YOUR KITCHEN and
MAKE MONEY!



BUY potatoes for 2c a lb. Make sensational new "Greaseless" Potato Chips and sell for 35c a lb. Ideal business for men or women in spare or full time. Small investment buys complete equipment. No experience needed. I show you how to get stores to sell all you make; tell you how to make profit first day. All information, pictures, prices and terms sent free. Send a postal card for Free Facts on this big "Home Business" Opportunity. G. H. HARDT, Dept. D-1812, 620 N. Michigan Ave., Chicago, Ill.

Saw-Filing

Pays Dollars for Spare Time
No Experience Needed

A FOLEY Saw Filer files hand, circular and band saws better than the best hand filer. Cash business, no canvassing, no eye-strain. J. L. Newman, Louisiana, says: "I only use my Foley Filer for a side line, and I would say that I take in from \$10.00 to \$15.00 a week now." Send coupon for FREE PLAN, no obligation.

FOLEY MFG. CO., 1219-S Foley Bldg., Minneapolis, Minn.

Send Free Plan on Saw Filing business.

Name.....
Address.....





SKIERS THRILL!

Biggest thrill in a skier's life... his first cannon-ball descent under perfect control! It's easier too, on Northland skis. Each pair is perfectly matched... uniform in grain, weight, balance and limberness. The famous Deerhead on Northland's five exclusive models guarantees you the finest skis money can buy. Write today for free booklet on How To Ski.

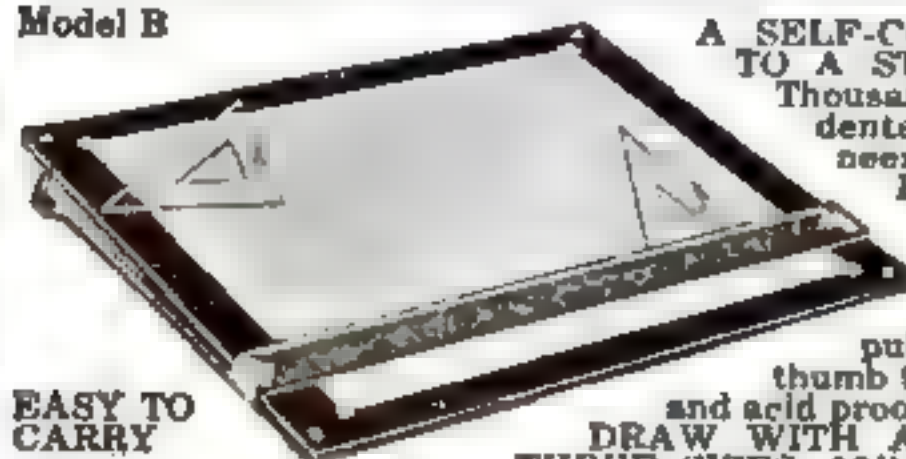
NORTHLAND SKI MFG. COMPANY

World's Largest Ski Manufacturers
94 Merriam Park St. Paul, Minnesota

NEW MODEL DRAW-O-MATIC DRAWING BOARD

ATTACHED, SLIDING, SELF-ALIGNING, PARALLEL-BAR

Model B



A SELF-CONTAINED UNIT BUILT TO A STANDARD OF QUALITY. Thousands in use by Draftsmen, Students, Architects, Artists, Engineers, Designers and Executives. Hard composition board stays flat. Light weight. Bar slides accurately and easily. Patent CROSS-STRUNG bronze cable and pulley give accurate action. No thumb tacks necessary. Water, oil and acid proof. ENABLES ANYONE TO DRAW WITH ACCURACY AND SPEED. THREE SIZES: 12"x16" \$2.95, 16"x20" \$3.95, 20"x25" \$4.95 plus postage. Other models with transparent celluloid straight-edge described in FREE CIRCULAR. WRITE TODAY.

ROLLIN INSTRUMENT CO. Inc., Dept. P.S. 12-8, 216 No. Clinton St., Chicago, Ill.

BE OUR REPRESENTATIVE IN YOUR TERRITORY

If you can spare an hour a day you can earn extra dollars taking care of Popular Science Monthly new and renewal subscriptions in your locality. Complete instructions and supplies will be sent free. Send your name and address to

EUGENE WATSON, Popular Science Monthly
353 Fourth Ave. New York, N. Y.

ASSEMBLE
THIS HIGH GRADE
ELECTRIC RAZOR AT HOME

Earn Big Money!

BUY ALL PARTS READY
FOR INSTANT ASSEMBLY—

NO TOOLS NEEDED—Make \$5 or more on every razor you sell. All matched unit parts from regular production line. Motor, field coils and cord come already assembled. No soldering equipment needed. A few minutes of your spare time can start you in a profitable business of your own making a regular standard super-quality electric razor—just like the ones selling in the higher-priced brackets (up to \$15.00). Order your first Kit from this AD or write for information.

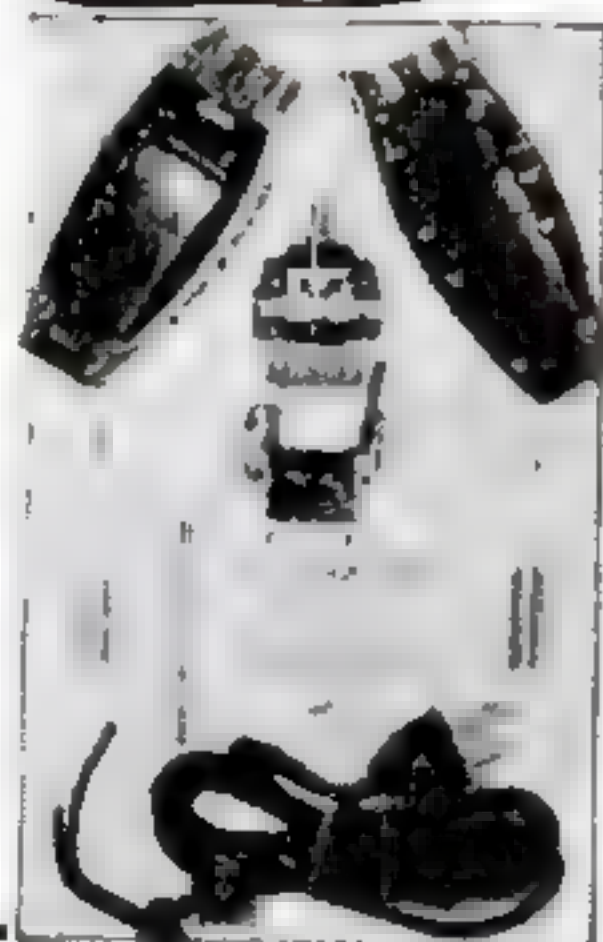
\$1.66 in lots of 3. Samples \$1.95 ea

SIMMONS MFG. CO., 126 W. North Ave., Chicago, Ill.

- ☐ Send C.O.D. 1 sample razor kit for which I will pay postman \$1.95 plus a few cents postage.
- ☐ Enclosed find \$.....for.....Electric Dry Shaver Kits including free instruction and money making plans.

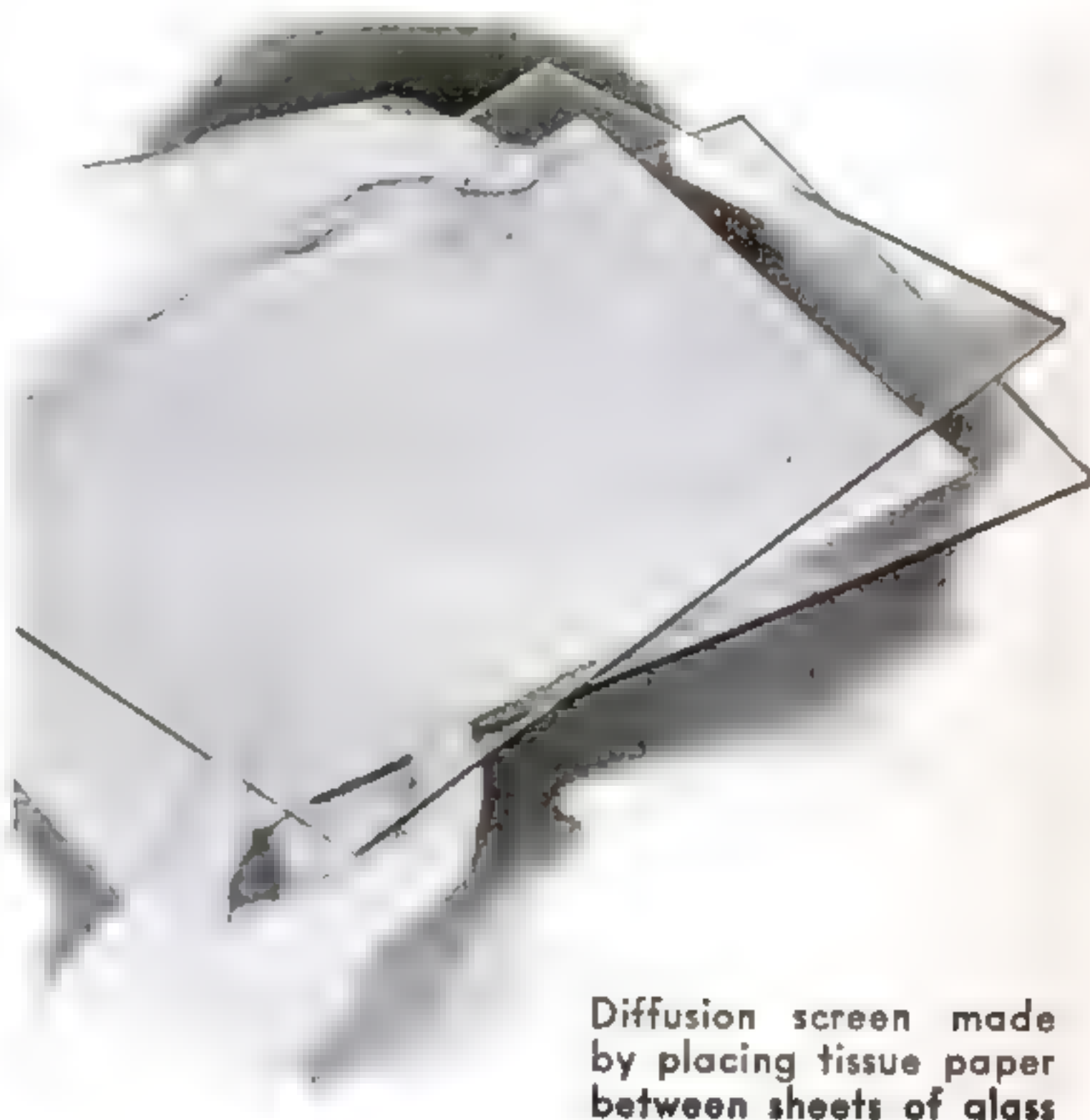
Name

Address



Ground-Glass Substitute for a Photo Printer

IF GROUND glass is not immediately available for making a diffusion screen for a home-made photo printing box, a sheet of tissue paper, sandwiched between two pieces of plain glass, will serve the purpose. This method may also be used to replace the ground glass in a commercial printer if it is accidentally broken. The diffusion of light for contact printing does not have to be so perfect as for enlarging.



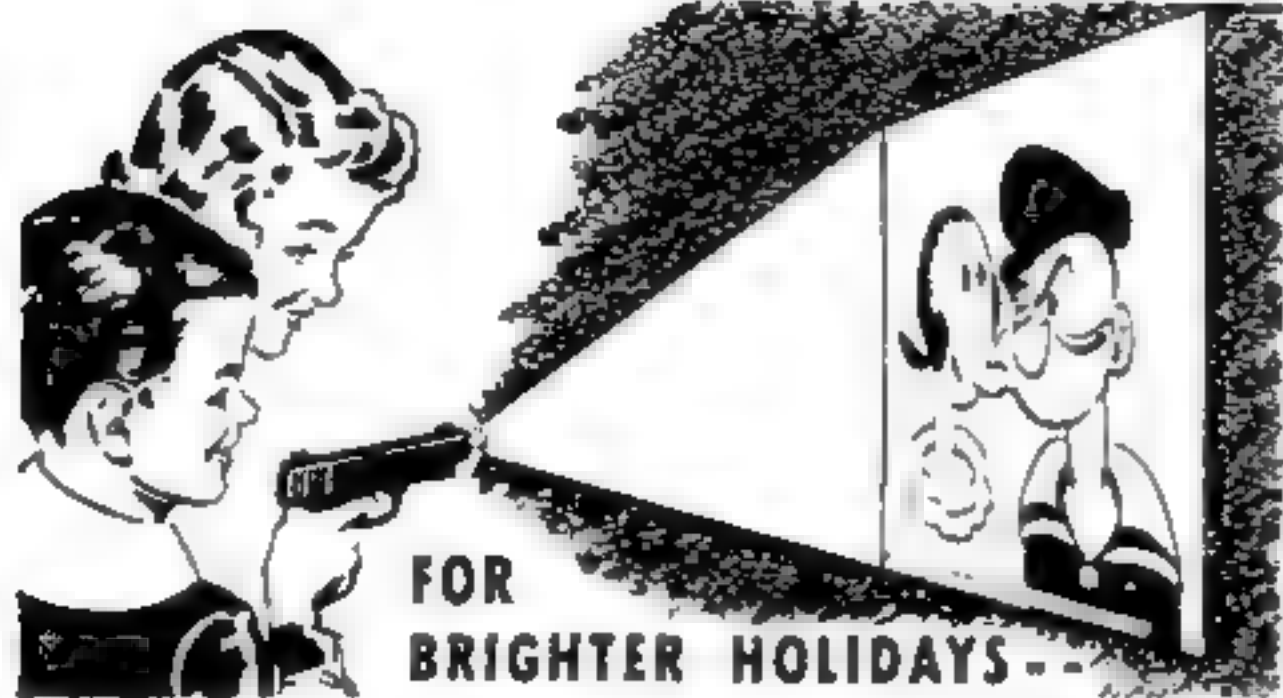
Diffusion screen made by placing tissue paper between sheets of glass

Camera Set Up Anywhere with a Burette Clamp

A RIGID, versatile camera clamp may be made from an ordinary burette clamp by those readers who are interested, like myself, in both photography and chemistry. I discovered that the threads in the center part

of the clamp match the standard threads of camera tripods. The part of the clamp that is attached to the ring stand is, of course, removed. Use a washer to prevent the thumb screw from scratching the camera, and cement rubber or felt to the inside of the jaws to protect the furniture.—MARLIN THURSTON.





FOR BRIGHTER HOLIDAYS -- "SHOOT" PICTURES

New, amazing AUTO-MAGIC Picture Gun. Flashes bright pictures on wall, ceiling, floor. Fascinating films: cartoons, comedies, adventures, historical, educational. Noiseless.



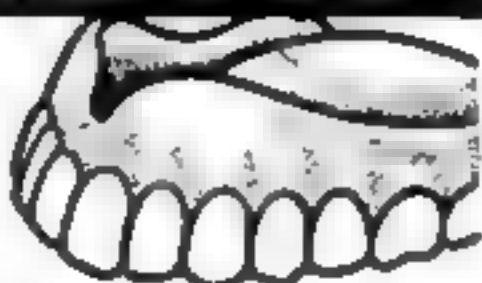
Batteries in handle—simply pull trigger. Entertain family and friends—give shows. Complete outfits, with films, "theatre," etc., in gift box, \$1. and \$1.50 at Stores. Or address—Stephens Products Co., Inc. Dept. 21, 19 East 47th St., New York.

FALSE TEETH

90 DAYS' TRIAL

LOWEST PRICES

If you need teeth, but do not care to spend much money, MY METHOD IS WHAT YOU WANT. MY MONEY BACK GUARANTEE gives you 3 months to see how they fit and look. I have thousands of satisfied customers in United States and foreign countries. MY SPECIAL METHOD is founded on 30 YEARS' EXPERIENCE.



SEND NO MONEY

Write TODAY for FREE Booklet and Material.

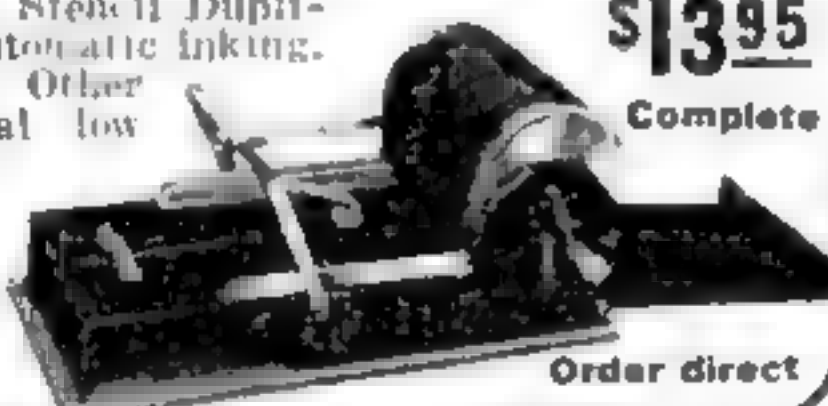
DR. CLEVELAND DENTAL LABORATORY

Dept. 33-T, 503-05 Missouri Ave., E. St. Louis, Ill.

AUTOMATIC STENCIL DUPLICATOR

Amazing new Print-O-Press Stencil Duplicator. Automatic feeding. Automatic inking. Full 8 1/4 x 14 legal size. Other models also, at sensational low prices. Details free, also free samples of work done. User-Agents write.

Professional Products
Dept. 1256, Silverton, O.



\$13.95

Complete

Order direct

HAVE DEPENDABLE FORD BRAKES

Your Ford has more brake area than heavier, higher priced cars but needs SIMPLEX FLOATING WEDGES to eliminate fade-out, adjustments, groans, etc. Install easily yourself.



A set of four, one for each wheel, all for \$1.25. Fits all models, 1928 to 1938. Send for a set today. They must satisfy you or your money will be refunded. Descriptive circular sent on request. . . Agents Wanted.

SIMPLEX WEDGE EXCHANGE, Dept. PS-12
813 Jefferson Street Ottawa, Illinois

VENETIAN BLINDS

Make your own at low wholesale cost. It's easy under our unique plan. All parts supplied. Send 10c for sample of tape, cord and slat, 15 color samples of tape and color chart.

VENETIAN BLIND MFG. & SUPPLY CO.

Dept. 4 B, 1760 Lunt Ave., Chicago, Ill.

Smokers Novelties

Also Toots and Casper, Boss and Bubbles, Harold Teen and Lillums, Boob McNutt and Pearl, The French Stenographer, Kip and Alice, Adam and Eve, The End of Helen, A Model's Life, Dumb Dora, A Bachelor's Dream Winnie Winkle, and over 100 more jokes of like nature. All the above will be sent to you the same day the order is received. Send cash, stamps or money order. ALL FOR \$1.00.

PLAZA NOVELTY CO.

Dept. P.L. 1141 Broadway New York City

\$5 for a DRY SHAVER that REALLY SHAVES

The HANLEY AC

A Marvel of Mechanical Simplicity

For AC Current

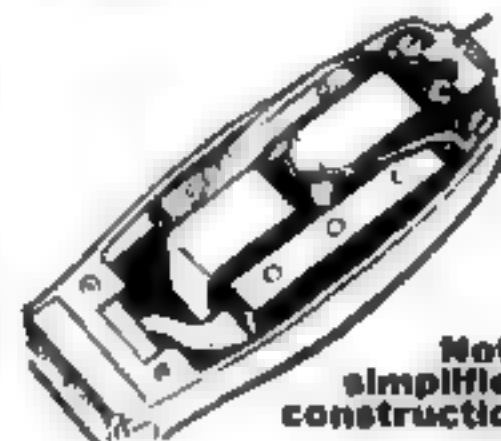
NO RADIO INTERFERENCE

HERE'S the answer to the thousands of men who have said "Where can I get a sensibly priced electric shaver that really shaves?"

The Hanley AC is scientifically made—yet it is really a marvel of simplicity—as simple as your doorbell mechanism, a little giant with twice the power required to shave the toughest, wiriest beard, a patented cutting head that lifts the bristles into position and cuts them cleanly, below skin level. No rotary motor to burn out, no brushes to wear, no "points" to clean. It's the simplified, trouble-proof electric shaver—guaranteed to give satisfaction. Order from your dealer or fill in coupon below and mail TODAY.



Also operates on DC with special current converter at \$1.50



Note simplified construction

• COUPON—

CLIPSHAVE, INC., Port Chester, N.Y.

Please send me one Hanley AC Dry Shaver.

I enclose \$5.00 (Money Order or check) ☐

Send C.O.D. I will pay postman \$5.00 ☐

Name.....

Street No.....

City..... State.....

YOU KNOW
YOUR
READING

at
a glance



LOOK
FOR THIS
DISPLAY

\$3.50
LIST
and up

MADE IN U.S.A.

Even in poor light, these black-on-white markings are easy to read. Wyteface saves time, reduces errors. (Ask any surveyor or engineer.) Full-strength steel checks kinks or curls. Bonded surface, easy to clean, protects the steel from rust. New, popular-priced model sold by hardware and building supply dealers. 25-50-75-100 ft. lengths. Send coupon for illustrated folder and prices.

K&E
FAVORITE WYTEFACE
STEEL MEASURING TAPES

KEUFFEL & ESSER CO... Est. 1867... Dept. 22, Hoboken, N. J.

Name.....

Address.....

FOR YOUR OWN WORKSHOP

These practical, easy-to-understand, fascinating handbooks will help you to get the most out of your hobby. Written by experts especially for Popular Science Monthly readers, they are invaluable to the mechanically minded man. You need not hesitate to order them for yourself or for gifts. *We guarantee complete satisfaction or money back.*

THE MOST PRACTICAL, EASY-TO-FOLLOW MANUALS EVER PUBLISHED

MAKING MONEY WITH YOUR CAMERA

Here is an exceptionally practical manual which will teach you many kinks and tricks, ways and means to take and sell pictures. It clearly demonstrates by pictures and directions the principles of picture taking that bring you photos which are marketable—and how and where to sell them. **COMPLETE, FASCINATING, EASY TO UNDERSTAND.** The ingenious amateur who can learn how to apply some of the simple rules in this book can make enough money with his camera to pay for all his photographic activities, and lay aside some welcome profit as well. 256 pages, full cloth bound, \$2.00.

Wood Carving and Whittling—

An Artistic and Interesting Hobby for All



Working in wood is the most fascinating and enjoyable of all hobbies. This new practical handbook starts with the simplest kinds of wood carving and shows you step-by-step, how to become expert. How to carve figures of men, animals, birds, with simple hand-tools. Chip carving, incising, level surface carving, relief carving, explained with simple step-by-step instructions and diagrams. How to carve furniture, ornaments, frames, jewelry boxes, trays, treasure chests, etc. Fully illustrated, 265 pages, full cloth bound, \$2.00.

All You Need to Know About Electroplating Now in One Practical Handbook

Written especially for the amateur, this book tells you how to utilize many odds and ends to build a complete home electro-plating workshop. Instructions, pictures, and diagrams show how easily you can do copper, nickel, chromium, silver and gold plating. How you can plate household or automobile fixtures, hardware, tools, silverware, ornaments, clocks, watches, bracelets, rings, metal parts of all kinds. How to plate with contrasting metals—obtain unusual finishes with chemical coloring. Scores of illustrations, diagrams, and pictures. 260 pages, full cloth bound, \$2.00.



RADIO BEGINNERS SIMPLIFIED MANUAL

Every radio operation from simple soldering to trouble shooting, to building and improving marvelous long and short wave sets, is made so simple and clear that you just cannot fail to understand many things that may have puzzled you before. A few minutes a day with this manual will teach you what it takes years to learn without it. Prepared by technical radio experts who **KNOW** how to explain things for non-technical radio enthusiasts. **POPULAR SCIENCE MONTHLY** publishes this book. Do not hesitate to send for it because **WE GUARANTEE** that if you are not satisfied we will send your money back to you. Cloth bound, 256 pages, hundreds of simplified drawings and diagrams. \$2.00.

DECORATIVE METAL WORK Simplified for Beginners

A brand new manual that tells in easy-to-understand language how to make useful metal articles in your home workshop with simple tools. How to do inlaying, spinning, cutting, etching, joining, plating and finishing. How to make jewelry, novelties, candle sticks, ash trays, lamps, hardware, and other useful metal articles. Full cloth bound, fully illustrated, \$2.00.



MODEL RAILWAYS

The Latest Manual on the Subject!

A practical handbook that shows how to lay out and operate a home-made model railroad. Easy-to-follow instructions for building a box car, gondola, refrigerator, tank, hopper, day-coach, pullman, baggage, observation car, and Atlantic type locomotive. How to turn out fireboxes, boilers, and wheels in your own shop. How to make an illuminated dispatcher's track diagram. How to build and install a block signal system, remote train control, automatic couplers, relays, etc. 256 pages, fully illustrated, full cloth bound, \$2.00.



OR FOR CHRISTMAS GIFTS

Now it's easy to build your own HUNTING AND FISHING LODGES, CABINS, BUNGALOWS

A big book of definite instructions made for beginners. If you can handle a hammer and saw, there's no reason why you can't build a bang-up cabin in the woods or a bungalow on the lake or shore, or a roadside stand, and make one you or anyone would be glad to look at, live in, or own.

Here are complete plans, and step-by-step instructions for every stage of the work. Designs for numerous log cabins, lodges, tourist homes, way-side stands, bungalows.

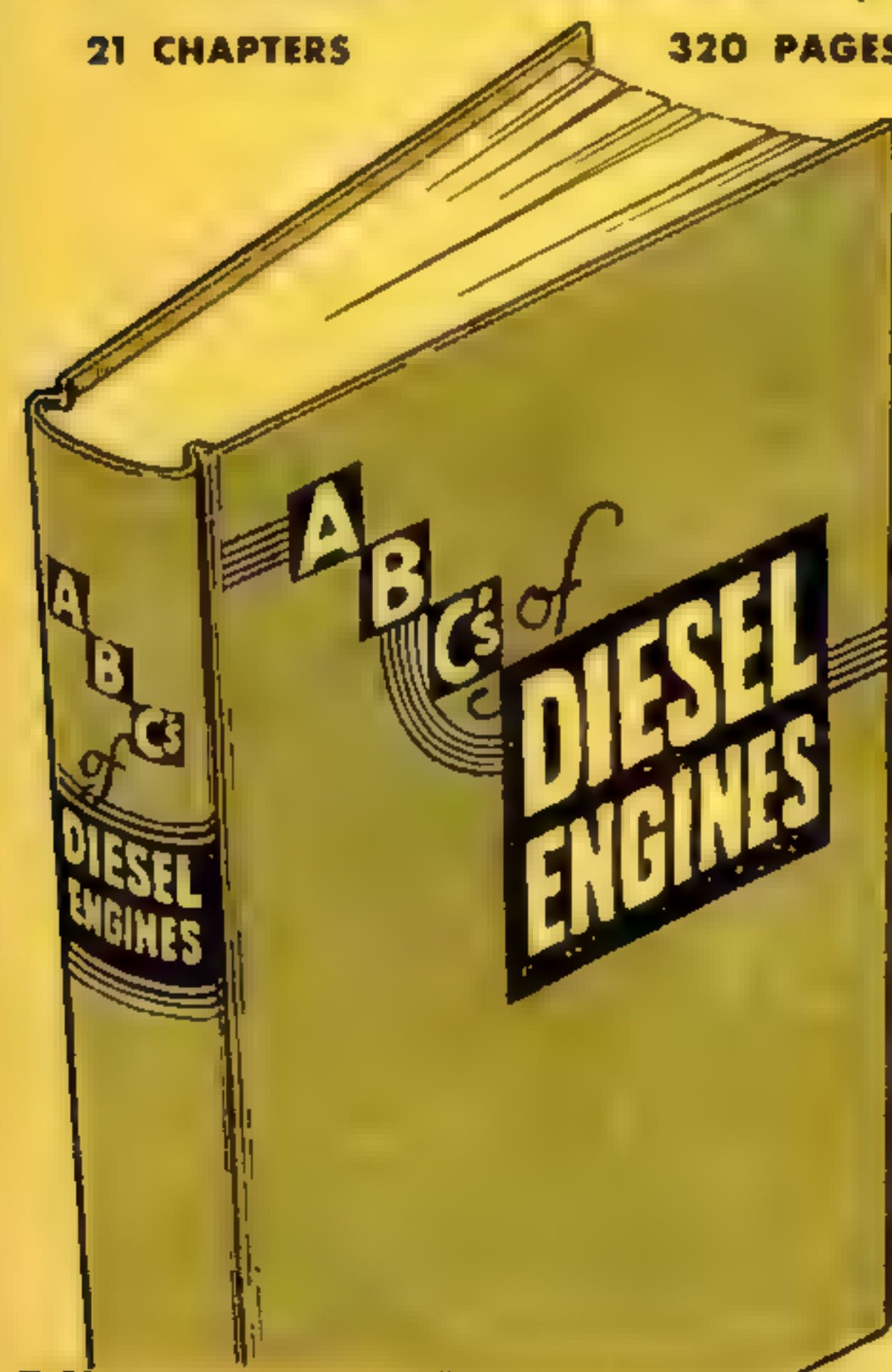
Not just a book of pictures but a full course of instruction. You will make no mistakes because every step is explained and shown in picture diagrams. Every problem of location, drainage, water supply, etc. is clearly explained. Tells how to cut and erect your structure—all about floors, roofs, windows, doors,—how to do the whole job from foundation to chimney top. What to do inside and outside. Don't imagine it's hard—when you see the book you'll be aching to grab some tools and get to work. 256 pages, full cloth bound, \$2.00.



LEARN DIESEL ENGINEERING WITH THIS NEW, SIMPLIFIED MANUAL

21 CHAPTERS

320 PAGES



Here at last is a brand-new book written for the man who has had no previous knowledge of Diesel Engines. Takes you in easy-to-grasp stages right from the fundamental principles of the Diesel to the most modern advanced types of engines. Tells you in clear, non-technical language just how and why the Diesel operates—what happens in the cylinders. All about pressure, volume, speed, and heat. Various fuels and how they are rated. Different types of Diesels, and their comparative economies—air and other types of starters, etc. Adapting the Diesel to automobiles, ships, trains, and airplanes. How you can take advantage of the many opportunities that Diesel Engineering offers.

Here Are Some Of The Important Chapter Headings

History of the Diesel • The Diesel Cylinder • Diesel Variations • Fuel Injection • Combustion Chambers • Hot-Bulb Oil Engines • High-Speed Diesels • Fuel and Lubricant • Starting and Reversing • Vibration • Diesel Relatives • Accessories and Cooling • Diesels on the Road • Diesel Work-Horses • Diesels on Rails • Diesels on Water • Diesels in the Air • Engine Designs • Diesels of the Future

The A B C'S OF DIESEL ENGINES is profusely illustrated from beginning to end, including useful tables, reference data, operating costs, and other information invaluable to the Diesel-minded man. You can depend upon the completeness and accuracy of this great book. Prepared by the editors of Popular Science Monthly from the very latest material, it's guaranteed to be up-to-the-minute in every respect. Full cloth bound.

Tear off and mail the coupon below TODAY, and we will send any of these books C. O. D., plus a few cents postage.

**SEND NO
MONEY
NOW!**

POPULAR SCIENCE, DEPT. 128B, 353 FOURTH AVE., NEW YORK, N. Y.

Please send me the book or books I have circled below. I will pay the postman the price shown plus a few cents postage in full payment when the books are delivered. (Money back if not satisfied).

Camera - \$2.00 Electroplating - \$2.00 Metal Work - \$2.00 Cabins \$2.00
Woodcarving \$2.00 Radio Experimenter \$2.00 Model Railways \$2.00 Diesels \$3.00

NAME

ADDRESS

CITY STATE

If you remit now we pay postage. Orders from outside U. S. A. cannot be sent C.O.D.

for a *Merry Christmas* and a **HOBBY NEW YEAR**



All-Purpose MOTO-TOOL

Moto-Tool makes an attractive, practical gift every craftsman will appreciate — for no other motor-in-hand tool in its class matches Moto-Tool in speed, power, ease of handling or in exclusive construction advantages that provide, long trouble-free service. Moto-Tool does in seconds jobs that require hours of hard hand work. Handles all accessories, works on all materials, runs on A. C. or D. C. Absolutely safe. Thousands in use. Model 1, 6 oz. 25,000 r. p. m., for light work. Model 2, more powerful, 13 oz. about 27,000 r. p. m. \$16.50 postpaid. At leading dealers — or order by mail on money-back trial. Write for free illustrated booklet. Dremel Mfg. Co. 1136 Ct., Racine, Wis.

Price
\$9.85 Post-
paid

Model 1

America's Exclusive Maker

of Motor-in-Hand Tools

Own A Profitable Greaseless **DOUGHNUT BAKESHOP** Start In Your Kitchen!

Who else wants to enjoy profits from this amazing new business you can start in your own kitchen? New electrical invention turns out delicious, different Brown Bobby Doughnuts. Everybody wants them! Stores eager to sell for you. Big profits for you every day selling production of one machine at wholesale only. We supply equipment and tested money making plans. This is your chance. Send No Money. Rush postcard for FREE details.

BROWN BOBBY CO.
820 N. Michigan Ave., Dept. C-812, Chicago, Ill.

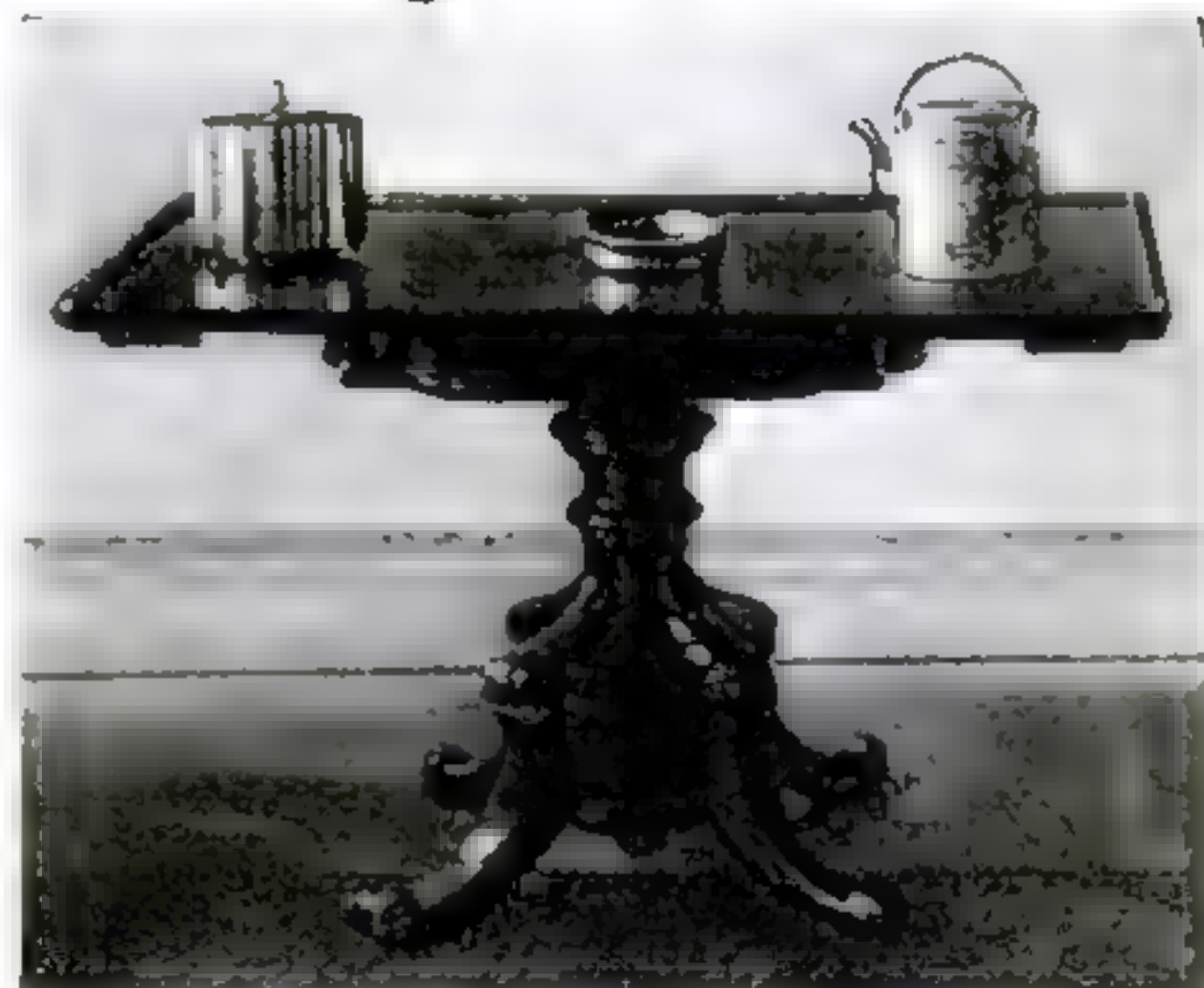


Piano Stools Converted into Coffee Tables

ATTRACTIVE coffee or cigarette tables can easily be made from old revolving piano stools. Once the varnish has been removed, the beautiful grain is apparent.

The seats of these stools are usually mounted on a carved wood frame 1' square. By removing the upholstery, you will have a substantial support for the table top. If you prefer an all-wood table, find a well-grained rectangle of similar wood about 2½' long by 1½' wide. This should be properly cleated underneath. Rub it down with powdered pumice and linseed oil, if you wish to give it an antique finish like the base. The edges of the top can be finished with a neat carved molding.

Another and simpler top consists of a large oval or rectangular tin tray, ornamented with painted fruit or flowers. One often can be purchased for a dollar up, depending on the condition. The paintings are not difficult to restore. When dry, apply a coat of alcoholproof varnish.—ARNOLD GUDMUNDSSON.

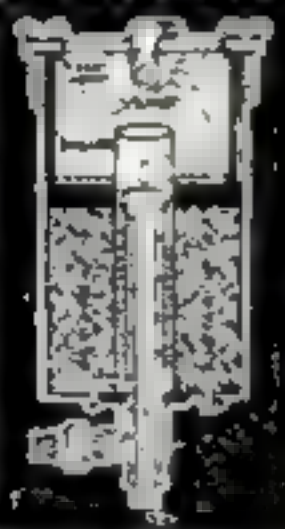


Mahogany stool with tin-tray top, and walnut stool with top gouged out for a rim

U.S. BUREAU
OF STANDARDS
Bul. 86 States
"Oil does not
wear out—
mechanically

**MONEY BACK
GUARANTEE**

"RECLAIMO"
Attached to
AUTOS-TRUCKS-TRACTORS-DIESELS
ends
**OIL CHANGING
FOREVER!**



Ordinary oil filters only remove solids and none of the other foreign destructive matter—thereby making frequent oil changes necessary.

"RECLAIMO"—The Super Filter-Refiner keeps crankcase oil *Clean and Oily indefinitely* by removing solids thru filtration—and gasoline dilution, water, corrosive acids thru the use of ex-

haust heat. Oil is only added to maintain level. Attached in place of present oil filters — makes oil changing a thing of the past. **THOUSANDS** OF ENTHUSIASTIC OWNERS in all parts of the country testify to the amazing money-saving action of **"RECLAIMO."** Read some of their remarkable statements in our **FREE** booklet "Oil Facts"—tells you more about oil than has ever been revealed before and may save you a lot of money. **DON'T DELAY!**

Get a copy of this booklet from your dealer or write to **RECLAIMO MFG. CO., 2306 N. Western Ave., Dept. F CHICAGO, ILL.**

This One



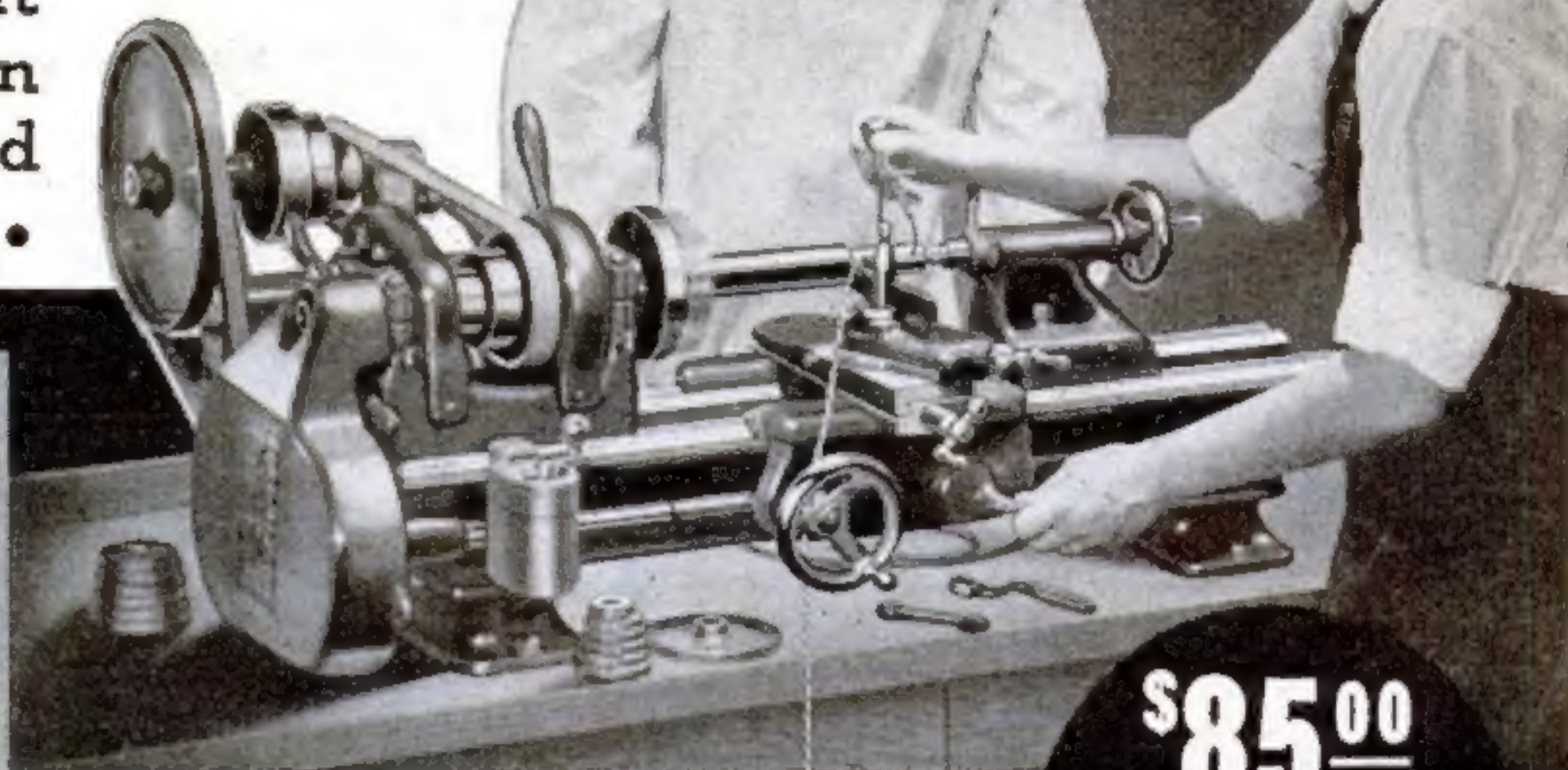
8JOS-WC8-C8JG



THE XMAS GIFT THAT WILL MAKE THE SHOP COMPLETE

An Ideal Present
to the Craftsman
Machinist and
Mechanic . . .

No. 415-YA, 9 $\frac{1}{4}$ " swing by 3'
bed Workshop Bench Lathe
with Horizontal Motor Drive,
 $\frac{1}{4}$ H.P. Reversing Motor,
Switch, Belts, and Adjustable
Belt Tension
Countershaft. **\$117.00**
Wt. 320 lbs
(\$15 down—\$7 mo. for 18 mo.)



\$85⁰⁰

Less Motor Drive
Sold on Easy Pay-
ments as low as
\$6.00 a month for
12 to 18 months.

THE SOUTH BEND BACK-GEARED, SCREW CUTTING METAL WORKING PRECISION LATHE

A Universal Lathe of Highest Quality and
Accuracy for doing Model Work—Home
Workshop Projects—Tool and Instrument
Repair—Gunsmithing—Engineering Jobs
—Inventive Work—Auto Repair—Electri-
cal and Radio Service—Laboratory Work—
General Shop Repair—and Metal Working
Operations of All Kinds.

Send Coupon FOR THESE BOOKS

"How to Run a Lathe"—128 pages, 350 illustrations
on lathe operation and valuable shop hints.

Catalog No. 46-A—illustrates, describes and prices
9" lathe in 3', 3 $\frac{1}{2}$ ', 4' and 4 $\frac{1}{2}$ ' bed lengths and 8 drives.

"The Home Workshop"—32 pages
showing interesting shop views,
equipment and shop instruction.



THE South Bend 9-inch Workshop Lathe is a

gift to please any man or
boy mechanically inclined.

Besides a tool which will per-
form practically every metal working job in the
shop, the 9" Workshop Lathe is a fine, precision
machine. Accuracy—speed—and durability
are designed and built into the 9" Lathe with
all the skill and experience our 32 years of
building fine lathes can produce.

Hundreds of different machining jobs can be
handled on the 9" Workshop Lathe, such as
drilling, turning, boring, reaming, cutting screw
threads, facing, milling, filing and chucking in
steel, iron, as well as wood, plastics, etc.

Features: Precision Lead Screw for cutting screw
threads 4 to 112 per inch, Ball Thrust Bearing on Spindle,
Twin Gear Reverse to Lead Screw, Automatic Longitudinal
Screw Feed, $\frac{3}{4}$ " spindle hole takes collets up to $\frac{1}{2}$ ".

38 attachments available for milling, grinding, draw-
in collet chuck work, taper work, and other operations.

Used by well-known manufacturers in this country and
abroad. The exacting requirements to which the 9" Lathe
is held in doing tool and die work, production operations,
etc., is proof of its accuracy and quality.

Other sizes in 9", 11", 13", 15" and 16" swing, bed lengths
3' to 12', C'shaft and Motor Drive. Priced \$85 to \$1500.

SOUTH BEND LATHE WORKS

829 East Madison St., South Bend, Ind., U.S.A.

SOUTH BEND LATHE WORKS,
829 E. Madison St., South Bend, Ind., U.S.A.

- ☐ No. 34LB, "How to Run a Lathe," 25c
- ☐ No. 46-A, 9" Workshop Catalog, Free
- ☐ No. 11W "The Home Workshop," Free
- ☐ Easy Payment Plan

Class of Work.....

Name.....

Address.....

City.....State.....

SOUTH BEND
Precision **LATHES**

**NEW! A LUXURY SHAVE
...FAST AND CLEAN...**

AT A LITTLE MORE THAN

**1¢
A BLADE!**



MARLIN-GUNMAKERS SINCE 1870 PRESENT-



Marlin
HIGH-SPEED BLADES

SO INEXPENSIVE—You Can Afford the Luxury of a Fresh New Marlin Blade Every Morning—and yet—SO GOOD—Thousands Will Tell You that they Get More Fine Shaves Out of a Marlin Blade than Any Other Make!

It's a real sensation—this new way of shaving. Instead of the old-fashioned scraping, nagging and hacking . . . once over and you have a clean, velvet-smooth, lightning-fast, perfect shave. That's because the new Marlin blade is made of fine Swedish surgical steel, the kind that will take a real "edge"—the kind that can be safely guaranteed by people who know steel—MARLIN, makers of fine guns for 67 years. Try Marlin's today. The big 20-blade package of double-edge blades costs only 25c, little more than a penny a blade. If you feel extravagant and want a real luxurious shave, use a fresh new Marlin Blade every morning. But don't forget. Thousands of men everywhere will tell you that you get more good shaves out of a Marlin Blade than any other blade made. Get them at any good store. **NOTE**—If your dealer hasn't yet received his supply, mail \$1 for 4 cartons (80 blades) or 50c for 40—or 25c for 20. 100% satisfaction guaranteed or send them back and get your money.



20 for 25¢

● **Single Edge Blades 15 for 25c**

MAIL COUPON TODAY
IF YOUR DEALER HASN'T GOT THEM

Marlin Firearms Co., Dept. P-12, New Haven, Conn.
Gentlemen: Enclosed find \$.....for.....Marlin
Blades. I can return them if I don't like them.
Name.....
Street.....
City.....State.....
☐ Check here if you want single edge blades—15 for 25c, 30 for 50c,
60 for \$1.00.
☐ Check here if you want a Marlin gun catalog.

ONCE OVER AND A CLEAN SHAVE



Chesterfields

...they double
your smoking pleasure

Good things are good because of their ingredients. Chesterfields are made from the best ingredients a cigarette can have . . . mild, ripe home-grown and aromatic Turkish tobaccos, cut into long even shreds, rolled in pure cigarette paper, and made just right for smoking.

*Millions of smokers say,
"Chesterfield's milder, better taste gives
me more pleasure."*



*They Satisfy
..millions*